HARVARD UNIVERSITY.

LIBRARY

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

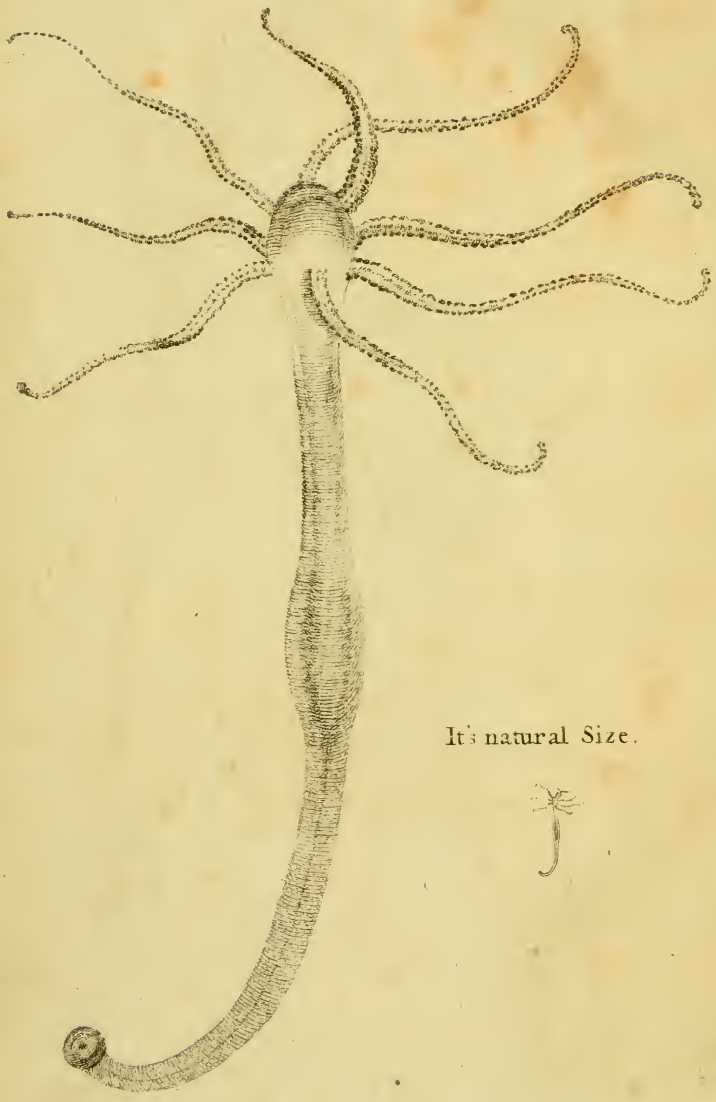
42090

BEQUEST OF

WILLIAM McM. WOODWORTH.

March 3, 1915.

THE POLYPE magnified.



It's natural Size.

An ATTEMPT towards a

NATURAL HISTORY

OF THE

POLYPE:

In A LETTER To

Martin Folkes, *Esq*;

PRESIDENT of the *Royal Society*.

DESCRIBING

Their different Species; the Places where to seek and how to find them; their wonderful Production and Increase; the Form, Structure and Use of their several Parts; and the Manner they catch their Prey:

With an Account of their DISEASES and CURES; of their amazing REPRODUCTION after being cut in Pieces, (as first discovered by Mr. TREMBLEY, at the *Hague*;) of the best Methods to perform that Operation, and of the Time requisite to perfect the several Parts after being divided: And

Also full DIRECTIONS how to feed, clean, manage and preserve them at all Seasons of the Year.

Likewise a COURSE of real EXPERIMENTS, performed by cutting these Creatures in every Way that can be easily contrived: shewing the daily Progress of each Part towards becoming a perfect POLYPE.

The Whole explained every where by great Numbers of proper Figures, and intermixt throughout with Variety of OBSERVATIONS and EXPERIMENTS.

By *HENRY BAKER*, Fellow of the *Royal Society*, and Member of the Society of *Antiquaries*, in *London*.

Rerum Natura nusquam magis quàm in Minimis tota est.
PLIN. Nat. Hist. Lib. xi. c. 2.

LONDON:
Printed for R. DODSLEY, at *Tully's Head* in *Pall-Mall*, and sold by M. COOPER in *Pater-noster-Row*, and J. CUFF, Optician, in *Fleetstreet*. 1743.
(Price bound Four Shillings.)

November 3. 1743.

At a Meeting of the *Royal Society*.

IMPRIMATUR.

M. FOLKES, *Pr. R. S.*

An Attempt towards a

NATURAL HISTORY OF THE POLYPE:

In A LETTER to

Martin Folkes, *Esq*;

PRESIDENT of the *Royal Society*.

SIR,

THE Accounts (which thro' your Hands) we have been favoured with from Abroad, concerning the little Creature called a *Polype*, have appeared so extraordinary, so contrary to the common Course of Nature and our received Opinions of *Animal-Life*; that many People have look'd upon them as ridiculous Whims and absurd Impossibilities. In order, therefore, to set this Matter right, I beg you'll give me Leave to lay before the

Publick, through the ſame Channel, ſome Obſervations and Experiments on this Creature, made with the utmoſt Care and Attention, before ſeveral Perſons of unqueſtionable Credit and Diſcernment, and written down from time to time with the ſtricteſt Regard to Truth.

That curious Obſerver of Nature, Mr. LEEUWENHOEK, firſt took notice of this Animal, and the uncommon Way its young Ones are produced, in the Year 1703. An Account whereof was by him communicated to the *Royal Society*, and made Publick in the 283d Number of the *Philoſophical Tranſactions:* but its more amazing Properties were reſerved for the Inquiſitive and happy Genius of Mr. TREMBLEY to diſcover, in the Year 1739.

This ingenious Gentleman met with the *Polype* in his Searches after the minute Inhabitants of the Waters; and obſerving it in ſome Reſpects to bear the Reſemblance of a Plant, and in others of an Animal, he reſolved, by cutting it in pieces, to ſatisfy himſelf, whether of the two it really was; and found, by this Trial, that, after a few Days, each Piece became a perfect Body, of the ſame Form exactly as *That* of which it had only been a Part: which Appearance would have determin'd him to conclude it to be a Vegetable, had he not diſcovered in it at the ſame time, a frequent Change of Figure, a Motion from place to place, a greedy and voracious

voracious Appetite, and a ſingular Dexterity in catching, maſtering and devouring Inſects and Worms, though much larger and ſeemingly ſtronger than itſelf: Circumſtances which could leave no doubt of its being a living Creature.

In conſequence of theſe Diſcoveries, he, ever ſince, has been making a Variety of ſuch Experiments as none but his own fertile Invention would, probably, have contrived. Theſe Experiments were performed in Sight of many of the Curious, and communicated to that celebrated Naturaliſt Monſ. REAUMUR at *Paris*, and to YOU, Sir, who ſo deſervedly fill the Preſident's Chair in the *Royal Society* at *London:* two Perſons, the moſt unlikely, perhaps, in the whole World, either to be impos'd upon, or to aſſiſt in deceiving Others. Some of theſe Creatures were likewiſe ſent both to Monſ. REAUMUR and YOU, leſt any Difficulty of finding them, might prevent, diſcourage, or delay making the ſame Trials in *France*, or *England*, as himſelf had done at the *Hague*.

Monſ. REAUMUR aſſures us, in his Preface to the 6th Vol. of his *Memoires pour ſervir a l'Hiſtoire des Inſectes*, that he repeated the moſt material of Mr. TREMBLEY's Experiments; and, to his great Amazement, found every one of them exactly anſwer the Accounts given. And YOU, Sir, as ſoon as you received the Creatures, ſet about the

ſame thing, with all the Judgment, Candour, and Circumſpection requiſite in Caſes of ſuch a Nature; freely inviting Gentlemen to your Houſe, to examine for themſelves, and make their own Eyes their Informers. But, as every Body could not do this, you took the farther Trouble (in order to ſatisfy the general Expectation of the Town) of drawing up, in the cleareſt and moſt conciſe Manner, and laying before the *Royal Society*, the Reſult of ſuch Experiments, as the ſhort Time would give you leave to make, which you have ſince permitted to be publiſhed in the *Philoſophical Tranſactions*, for the Information of all the World.

YOU was, likewiſe, ſo obliging to favour me with three of your *Polypes*, very ſoon after their Arrival, with Intent that I ſhould put them to the ſevereſt Teſt; and, to encourage and aſſiſt me in ſo doing, have frequently honoured me with your Company, and been yourſelf a Witneſs of my Proceedings. TO YOU, therefore, I owe my Teſtimony of the Truth, as given in the following Obſervations and Experiments, many of which were made under your own Eye; and, it is with great Pleaſure, I ſeize this Opportunity of acknowledging my Obligations to you for Abundance of other Civilities and Favours.

With theſe three *Polypes* I began my Experiments, on the twenty fifth Day of laſt *March*,

March, though the Weather was then exceſſively cold, and continued ſo to the End of *April*. And I have gone on till this very Day repeating moſt of them ſeveral Times over, without finding any conſiderable Difference, but that of a much quicker Growth and Separation of the Parts cut to Pieces as the Weather became warmer. A Difference not ſufficiently important to render more than one Experiment of a kind neceſſary to be laid before the Publick. Though it may not be improper to remark, that what by Diviſions, Subdiviſions, and the Creature's natural Increaſe, ſeveral hundreds have been produced by my firſt three, between *March* the twenty fifth, and the preſent fourth Day of *Auguſt*.

Theſe, however, were not all the *Polypes* I have had under my daily Care and Inſpection: for on the eighth of *April*, Mr. Ellicott, F.R.S. gave me ſix *Engliſh* Ones, taken in a Pond at *Hackney*; and they, ſince that time, have I believe produced me no fewer than your *Dutch* Ones did. From him I received, likewiſe, on the nineteenth of *May*, ſeven or eight green Ones, that were found in *Eſſex*; which have alſo increaſed conſiderably. And, in *July* laſt, you favoured me farther with ſome of the long-arm'd Sort, juſt then arrived from Monſ. Trembley.

I ſhall, by and by, more particularly deſcribe theſe four different Species of *Polypes*,

and only tranſiently make mention here of them and their Increaſe, as ſome Proof that I have not formed Concluſions from ſingle Inſtances, or wanted ſufficient Numbers whereon to ground the Obſervations and Experiments I am haſting to lay before you.

In truth, from the Time I firſt had any of theſe Creatures, I have been examining them daily, both with and without the Help of Glaſſes, and have attended with the ſtricteſt Care to all their little Motions, Contractions, Extenſions, and different Poſtures, as well as to their more extraordinary Properties, that I might thereby be enabled to give ſome reaſonable Account of their Structure and Diſpoſition.

Could, SIR, your other Cares and Endeavours for the Improvement of Natural Knowledge, by your Correſpondence with learned Men both at Home and Abroad, and your hearty and unwearied Attention to the Concerns of the *Royal Society*, have permitted you to go on with and give a farther Account of your own Experiments, mine had never preſum'd to think of appearing publickly; but ſince you was obliged to decline the Taſk (which nobody elſe amongſt us, that I know of, has undertaken) and have been pleas'd to aſſiſt me with your Obſervations from time to time, as well as to take the Trouble of examining and conſidering mine; I am in hopes theſe Attempts may have ſome little Merit:

Merit: tho' they make no Pretence to that Clearneſs of Judgment and Expreſſion which are ſo diſtinguiſhable in the Pattern you have laid before me.

All Deſcriptions of the Forms of unknown Things, or Things we are but imperfectly acquainted with, prove unintelligible, or at leaſt unſatisfactory, without the Help of Pictures: I have, therefore, taken care to explain my Meaning all along by ſuch Repreſentations as I thought might be neceſſary to ſatisfy the Reader's Curioſity; and this I have done, more particularly, through the whole Courſe of my Experiments: where I preſume it will be found agreeable, to ſee in what Manner, and by what Progreſſions, the Parts of *Polypes* cut in Pieces proceed, gradually, towards the Reproduction of all they want to render them compleat and perfect.

The great Number of Figures requiſite for this Purpoſe, would have occaſion'd too large an Expence, had they been engraven on Copper; and after all, as they could not then have been intermixed with the Letter-Work, but muſt have been printed on ſeparate Leaves, would have produced a good deal of Trouble in turning continually to them: but by being cut in Wood, they lye much more conveniently under the Eye in the Places whereto they properly belong, and though not ſo beautiful as Copper-Plates, yet (being done by the beſt Hand we have) they

they may ſerve pretty well, I hope, to give an Idea of what they are intended to ſhew *.

You, SIR, who know my Way of thinking, will not I am perſuaded ſo far miſtake me, as to imagine I am attempting, by this Eſſay, to vie either with yourſelf, or Mr. TREMBLEY; but it may not be improper to aſſure that Gentleman and the World, who are not ſo well acquainted with me, that I am as far from, as unequal to, ſuch a Deſign; and that my real and only Motive to the many Experiments I have made, to the Care I have taken in propagating theſe Creatures, to the Readineſs wherewith I have ſent Numbers of them to *Oxford* and *Cambridge*, and diſperſed them, as much as I have been able, amongſt the Curious, and to this preſent Undertaking, has been to vindicate the Truth: which ſuffers ſometimes for want of proper Means to prove it: and to diſplay before Mankind, a new Inſtance of the amazing Power of the Creator.

Permit me, SIR, e'er I proceed farther, to pay my Thanks to You, and to ſeveral other ingenious Gentlemen, who have obliged me with their Company and Aſſiſtance at many of my Experiments; and particularly

* Theſe Draughts were taken from the Microſcope, as magnified by the fifth or ſixth Glaſs, which enlarges the Object no more than what is juſt ſufficient to ſhew it diſtinct and clear.

to my good and worthy Friend Dr. JAMES PARSONS, F. R. S. who, together with an unbounded Curiosity, a sincere Love of Knowledge, and a penetrating sound Judgment, is peculiarly happy in being capable of giving his Ideas a Reality by the Excellence of his Pencil.

As a Division into *Chapters* will render what follows more useful than it would be otherwise, I shall make no Apology for so doing.

CHAP. I.

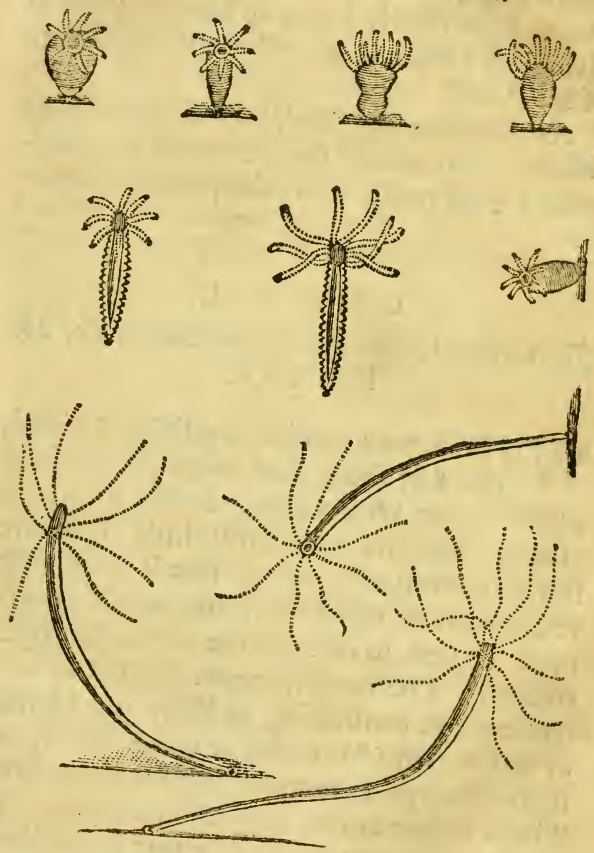
The General Appearances and Motions of the POLYPE.

WHEN we examine any living Animal, the first thing that naturally presents itself to our Observation, is its Form or Shape: but this wonderful little Creature shifts its Posture so often, that it is difficult to ascertain its real Form, and would be almost endless to describe the several Changes thereof. The most frequent is that of extending and contracting its Body and Horns, or rather Arms*; which it can perform, to such a Degree, as to render itself ten or twelve Times longer at one time than another. It usually fastens by the Tail, either to the Bot-

* As these Parts serve the Purposes of Arms rather than Horns; I shall chuse all along to call them by that Name.

tom

tom or Side of the Veſſel it is placed in, and thus ſituated, ſtretches out, or ſhortens itſelf at Pleaſure. Some of its Forms under theſe Circumſtances are hereunto annex'd.



I have ſometimes ſeen the ſame *Polype* in all theſe Poſtures, within the Compaſs of an Hour.

EXPLA-

EXPLANATION of the FIGURES.

The firſt Line of four Figures, ſhews the Polype *in its moſt contracted State.*

The next two Figures, that appear with Wrinkles on their Sides, repreſent it when about half-way contracted: and the third Figure ſhews it almoſt quite contracted, hanging by the Tail.

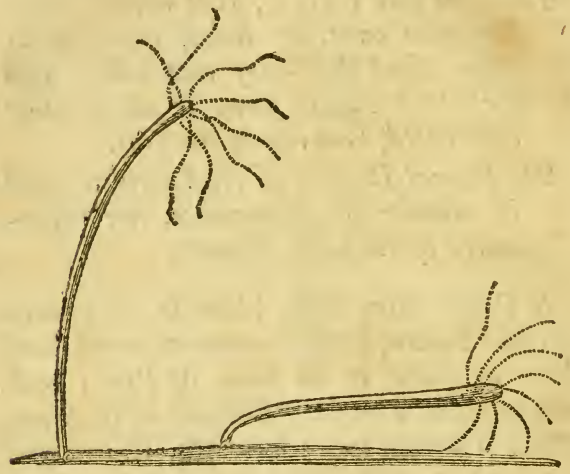
The ſeveral Degrees of its Extenſion, and its manner of Appearance, are repreſented by the other Figures.

A *Polype* turns itſelf, likewiſe, into ſeveral other Forms, either in order to crawl from place to place, or to ſeize its Prey; both which it effects by the Aſſiſtance of its Arms. When it would move forwards, it ſtretches out the Arms and Body, and fixing its Arms to ſomething, draws up its Body towards them by Contraction in this manner.

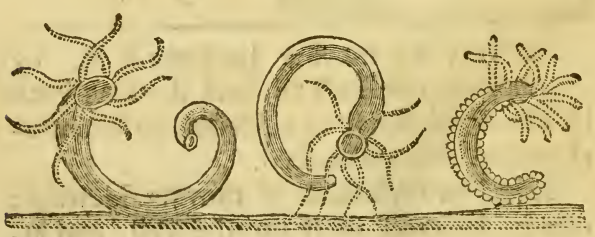
Its Way of moving backwards is, by lengthening out its Tail, and drawing back its Head and Body, in a Manner juſt contrary to that above deſcribed.

It has two Methods of moving ſideways: one is, to erect itſelf on the Tail, and incline

cline its Body which Way it pleaſes; the other is, by an odd Poſition of the Arms, to roll its Body over and over, ſideways, as it lies extended.



When the *Polype* would turn itſelf about, it brings the Head and Tail together, by bending its Body; and then, fixing the Arms, directs the Tail-Part that Way the Head-Part lay before, as in the Figures underneath.



It

It likewiſe uſes another very extraordinary Sort of Motion with its Arms and Body, whereby, crawling up the Sides of the Veſſel to the Top of the Water, and hanging there by the Tail, with its Body and Head downwards, it rows itſelf about by the Help of its Arms, in queſt, I ſuppoſe, of Prey. This I have ſometimes, tho' not often, ſeen: but I make no doubt it may frequently do thus in Ditches, with Deſign to catch ſeveral Kinds of Flies and Inſects, that are to be found only near the Surface.

It then appears in this Manner, with an Air-Bubble at its Tail.

It alſo hangs ſometimes upon the Surface of the Water with the Tail downwards, and appears thus.

And ſometimes it lies along, extending its Body and Arms on the Top of the Water, as in this Figure.

This

This Creature has a Variety of other Poſtures, which it would ſeem trifling to attempt deſcribing: faſtening itſelf ſometimes to the Veſſel by its Head and Arms, and raiſing its Tail upright: coiling its Body, at other times, in a circular Figure, and covering its Head with its Tail; and frequently rubbing or ſtroking its Head and Body with its Mouth and Arms, as it were to clean or dreſs itſelf, or remove ſome Uneaſineſs it feels.

Its common Motions are very ſlow, excepting thoſe of extending and contracting the Body and Arms, which are performed in nearly the ſame Time as a Snail takes up to come out of, or retire into its Shell, and in a manner not much unlike it. In ſeizing and maſtering its Prey it is however ſurprizingly nimble. It can lengthen out or ſhorten its Arms, without extending or contracting its Body; and can do the ſame by the Body, without altering the Length of its Arms: both, however, are uſually moved together, at the ſame Time and in the ſame Direction.

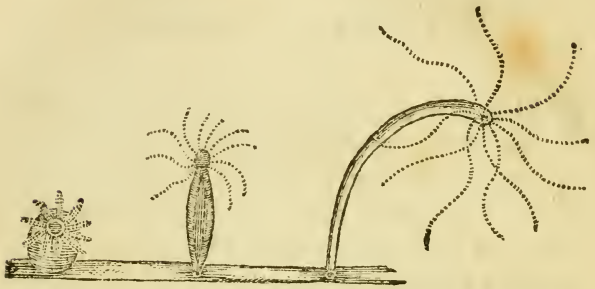
CHAP. II.

Of the Sorts of POLYPES.

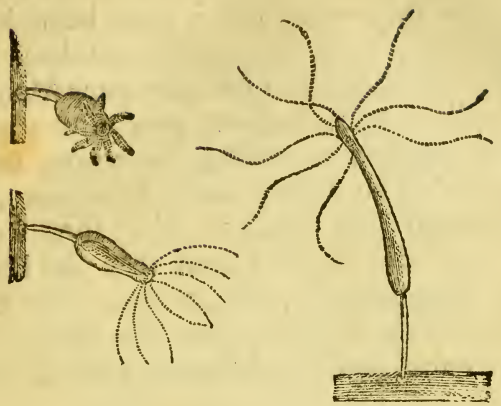
THERE are, no doubt, ſeveral Species of *Polypes*, differing from each other in many particulars as well of Figure as Size. I have, at preſent, four Sorts in my Glaſſes, whereof I ſhall give a brief Deſcription, and ſhew the Figures of them all, in their contracted, in their middle, and in their extended State.

The Firſt, is that Species Mr. TREMBLEY ſent from the *Hague* in *March* laſt, ſome of which (as now grown) have Bodies, when fully extended, more than an Inch and half long: tho' the ſame, when contracted, exceed not one tenth of an Inch. In this ſhorten'd State a little Knob or Button, ſomewhat tranſparent, appears at their poſterior End, and may be call'd a Tail; but when they are ſtretched out, it differs ſo little from the Body as ſcarce to be taken notice of. When full, or contracted, their Bodies appear of an Hair or light Cheſtnut-colour, but when empty and extended are almoſt white. Their Number of Arms is from eight or ten, to twelve or fourteen, tho' the

moſt common Number is ten. The Colour of the Arms is white.



My Second Sort were taken in a Pond at *Hackney*, and given me by Mr. ELLICOT, at the Beginning of laſt *April*. When firſt they came to me, they were much ſmaller than the *Dutch* ones; but by Care and good Feeding are now grown rather larger than they. The Tails of theſe are long, ſlender and tranſparent, and when placed before the Microſcope, a long ſtrait Gut may plainly be diſtinguiſhed paſſing from the Body-Part or Stomach to an Opening at the End thereof. Theſe are rather lighter-coloured than the former, and have ſeldom more than ſix or eight Arms, but thoſe capable of great Extenſion. Some Figures of them are in the following Page.



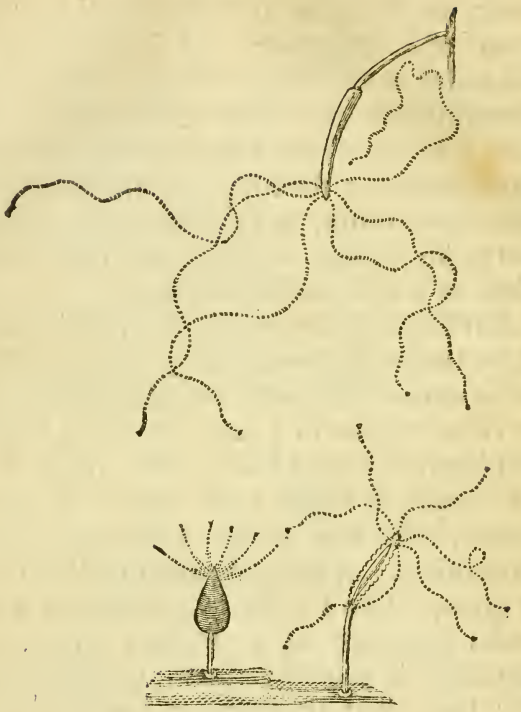
The Third Sort are of a Graſs-green Colour. Theſe were alſo given me by Mr. Ellicot, about the Middle of *May*, and were taken, he told me, by Mr. Du Cane, in *Eſſex*. They were extreamly ſmall when I received them, being at their utmoſt Extenſion not above a quarter of an Inch in Length, and different from my other *Polypes*, not only in Colour, but likewiſe in their Arms, which were much ſhorter in proportion to their Bodies, capable of but little Extenſion, and narrower at the Root than the Extremity, which is contrary to the other Species. Their Arms were ſo ſhort, they could not claſp round a very ſmall and ſlender Worm, but ſeem'd only to pinch it faſt till they could maſter and devour it, which they did with as much Greedineſs as any. I imagined theſe *Polypes* owed their green Colour to

ſome particular Food, ſuch as Weeds, *&c.* and that they would loſe it upon being kept to Worms; but I find myſelf miſtaken, for they retain their Greenneſs after ſome Months as well as ever, and are now grown of a moderate Size, extending ſometimes three quarters of an Inch; their Arms are alſo lengthened very much to what they were, and are of a lighter Green than the Body, their Number eight, nine, or ten. The Tail is very little ſlenderer than the Body, but more ſpread at the End than the Tails of other Kinds.

My Fourth Sort, are ſome of the long-armed Ones, which you, SIR, received at the End of *July*, from Mr. TREMBLEY, and, the next Day after their Arrival, was ſo good to preſent to me. Theſe are the lighteſt coloured I have yet ſeen, being when hungry, and extended, almoſt quite white; and when full, of a kind of Pink Colour: both which Appearances I impute to the exceeding Thinneſs of their Skin. In all *Polypes*, when firſt a Worm is ſwallowed, the Shape of it may be ſeen (and that doubled moſt commonly) in the Stomach: but after a little

while, as it digeſts and diſſolves there, the Form of it diſappears, and it only gives a Colouring to the *Polype*'s Body: both which Circumſtances are moſt remarkable in this Kind; for in Theſe the Worm is diſcerned more plainly at the firſt, and the Blood and Juices afterwards, in Digeſtion, give a pleaſant ruddy Tinge; whereas they only render others of a dark and dull Colour.

But Theſe are more particularly diſtinguiſhed by having Tails very long, clear and ſlender, even in their moſt contracted State, and by Arms capable of a moſt ſurprizing Extenſion (even to ſeveral Inches) tho' the Body is not longer or larger than that of the other Species, with little Knobs or Buttons at their Extremities. A fuller Account of them will be given, when I come to deſcribe the wonderful Structure of a *Polype*'s Arm, and therefore, it may be ſufficient to obſerve farther here, that they ſeldom are more than ſix in Number. The Manner of their Appearance is ſhewn in the following Page.



From your Kindneſs, SIR, in permitting me to have a Sight of Mr. TREMBLEY's Letters, I am able to inform the Publick, that the Induſtry of this Gentleman has diſcovered ſtill more Sorts of *Polypes* than the abovementioned; and, particularly One, that is very extraordinary for having about its Head fifty or threeſcore little Horns or Arms; all which together, when the Animal is undiſturbed, make a circular Motion in the Water like the turning of a Mill-Wheel, and

and thereby form a Current that brings along with it many ſmall Inſects within the Reach of its Arms, which inſtantly catch them, and after a moſt wonderful Manner convey them to the Mouth. This Sort he calls *Polypes à Pennache*, or, *plumed Polypes*; from the Reſemblance their little Arms bear to Feathers. They adhere, he ſays, to the Stalks or Roots of Water-Plants, and have a Skin or Caſe, whereinto, when diſturbed, they withdraw their Bodies and Arms: but as ſoon as all is compoſed and quiet, they put them out, and go to work again.

This Deſcription inclines me to believe, they are the very ſame Animals Mr. LEEUWENHOEK took notice of, as living in a Sheath or Caſe, (which they faſten to the Roots of Duck-weed) and having two ſeeming Wheels with a great many Teeth or Notches, coming from their Heads, and turning round as it were upon an Axis: but, he tells us, at the leaſt Touch, the Wheel-work is drawn into the Body, and the Body into the Sheath. The Particulars of Mr. LEEUWENHOEK's Account, and two or three Figures of the Creatures themſelves, are given in the 91ſt Page of my *Treatiſe* on *Microſcopes*, to which, therefore, I muſt beg leave to refer. But I muſt juſt obſerve, that if this Animal is really the *Plumed Polype*, it affords freſh Occaſion of admiring the Diligence of Mr. LEEUWENHOEK, whoſe careful Searches

few Things ſeem to have eſcaped; and alſo of remembring, that it was he, who diſcovered another Kind of Animal with two Wheels at its Head-End, forming a like Current, and probably for the ſame Purpoſe, in a reddiſh Mud or Earth found frequently in leaden Pipes or Gutters on the Tops of Houſes: whereof a Deſcription is likewiſe given in *Page* 92. of the Book above referr'd to. When the Water dries away, they contract their Bodies into an oval Figure of a reddiſh Colour, and become fix'd in the dry Dirt: which being put in Water, though after ſeveral Months, in about an Hour's Time they open, by Degrees extend their Bodies, ſwim about, and play their Wheel-work. Thouſands of theſe I have now by me: they are eaſily got, and kept, and highly deſerve the ſtricteſt Examination and Admiration of the Curious.

CHAP. III.

Of the POLYPE's Body.

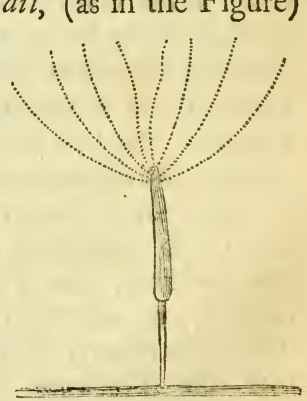
THE Body of a *Polype* has no Part that that can be called either Back or Belly: but appears, when extended, like a round Pipe or Tube, and when contracted, like the Seed-Veſſel or Head of a Poppy. It conſiſts of two Coats, between which there lies a Space

Space that always remains tranſparent, even when by Fullneſs, or Contraction, the other Parts are rendered quite opake: and in this Space the Microſcope diſcovers a Kind of fluctuating Motion, very much like that in the Arms, wherewith it ſeems to communicate. The outward Coat is white like the Arms, and made up of minute *Annuli* or Ringlets, that double in the midſt, and can, occaſionally, be folded cloſe together, in the manner of a Paper Lanthorn. Theſe may plainly be ſeen, when the Body is in its middle Degree of Extenſion: but when it is quite ſtretched out, they become unfolded, and conſequently not diſtinguiſhable; and when quite contracted, are not perceivable, by their being brought too cloſe. The Appearance of them may be underſtood by ſome of the foregoing Draughts.---See the Figures, *Page* 12 and 14.

Such a Structure accounts, in ſome meaſure, for that extraordinary Ability this Creature has, of ſo extending or contracting every Part about it, that it is difficult, if not impoſſible, to aſcertain the real Length or Thickneſs of any. It will eaſily be conceived that the Thickneſs muſt increaſe as the Length diminiſhes: for its Body is, probably, compoſed of longitudinal, and circular, or perhaps ſpiral Fibres, both capable of great Extenſion or Contraction; and which counteract, in ſuch a Manner, that when one extends,

tends, the other muſt neceſſarily contract, and *vice verſa*. I have ſeen *Polypes* with Bodies almoſt three Inches long, and as thin as the ſmalleſt Straw, that have been ſhortned in a Moment to leſs than a quarter of an Inch, with the Thickneſs of a Gooſe-Quill. But ſuch large ones are very rare, and one ſeldom ſees 'em above an Inch, in their extended State. They can ſtop themſelves at any Degree either of their Extenſion or Contraction.

When a *Polype* lengthens out its Body and Arms, which it ſeldom does but when empty and hungry, its Form is not very unlike a Whirl or Joynt of the Water-Plant called *Equiſetum* or *Horſe-Tail*, (as in the Figure) and it has then pretty much the Whiteneſs and Clearneſs of a wetted Bladder; but when full, or empty and contracted, it appears of a dark Colour and opake. The longer it has faſted, the more tranſparent it becomes: but whether full or empty,



the Tail-End, for a little Way, always retains its Tranſparency; the Stomach appearing to terminate at ſome Diſtance from its Extremity. In the contracted State this Tail-End ſeems like a ſhort Knob or Button, but extends

extends with the Body of the *Polype*. Some Sorts of *Polypes* are diſtinguiſhable by the Length of this Tail-Part, which in them is much ſlenderer and clearer than the reſt of the Body: and it is remarkable, that theſe long-tail'd *Polypes* have commonly long Horns alſo. The *Polypes* found at *Hackney*, and given me by Mr. ELLICOT, have this Length of Tail, and ſo have the long-arm'd Sort you lately receiv'd from Mr. TREMBLEY, with ſome of which you was ſo kind to oblige me. Through the Middle of this long Tail a Gut is very plainly diſtinguiſhable by the Microſcope, (which cannot ſo eaſily be perceived in the ſhorter ones) paſſing from the Stomach to an Opening at its Extremity, which I ſhall call the *Anus:* ſince I have, ſeveral times, ſeen the Dung of the *Polype* in little round Pellets diſcharged at this Outlet or *Anus*.

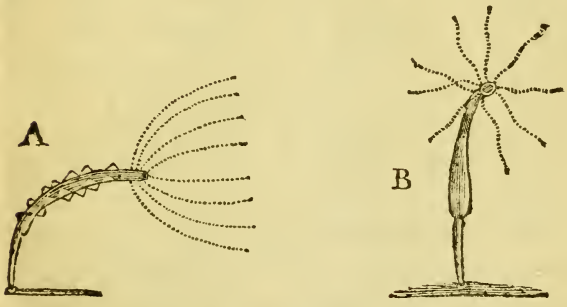
Much the greater and groſſer Part of what the *Polype* eats, is moſt certainly thrown out again by the Mouth, after lying a proper Time to become digeſted in the Stomach: and, for a good while, I imagined there was no other Evacuation; but am now convinced, that the finer Part, in ſmall Quantity, is carried downwards through the Tail, and paſſed off that Way. I believe, however, there is alſo another Purpoſe to which this Paſſage ſerves, and that is, to convey a *Mucus* or ſlimy Matter to the End of the Tail, for

for its more ready Adheſion to Sticks, Stalks, or other Bodies. And this I am inclined to think, not only from its fixing conſtantly by that Part, but likewiſe from obſerving a Redundance of ſuch *Mucus* frequently flowing from it: then, eſpecially, when the Tail has been cut off, before it gets a Head, and conſequently whilſt there are no *Fæces* to be diſcharged thereby. A Slime or *Mucus* will likewiſe iſſue from other Parts, tho' not in ſo great Abundance; but, whenceſoever it comes, the *Polype* ſhould be aſſiſted to get rid of it, by being waſhed in freſh Water, and having it gently pulled away. For it will occaſion a Diſſolution or Beginning Mortification, that will grow daily worſe and worſe, unleſs proper Care be taken; and, even after all, it becomes ſometimes an incurable Diſorder; in which Caſe, the ſhorteſt and beſt Remedy is, to cut off the diſtemper'd Part, ſince in a few Days after the *Polype* will then become as perfect as ever.

The moſt effectual Method of preventing this Diſorder is, to give them freſh Water every two Days at fartheſt, if the Glaſſes you keep them in are ſmall: for otherwiſe the Water grows ſo charg'd with this ſlimy Matter, that it ſeems as if full of Cobwebs, and much inconveniences the *Polypes.* When this Slime is viewed in the Microſcope, it ſeems to be a Congeries of long ſlender Hairs, like exceeding fine Flax or Wool: this entangles

tangles in the delicate Arms of the *Polype*, prevents their Motion, and diſables them from taking their Prey.

When a *Polype* extends in Water, its Body commonly ſeems ſmooth and ſlippery, and has a good deal the Reſemblance of a Snail's; but on ſome there are ſeveral white protuberant Subſtances ſtanding out from the Sides, and appearing pointed and irregular. Others have a remarkable dark Spot acroſs the Body, eſpecially when not quite empty. Both theſe Caſes are repreſented by the Figures A and B.



Permit me, SIR, for my Readers fuller Information, to add your Account of the *Polype*, from the *Philoſophical Tranſactions*, N°. 469. Page 424. Your Words are Theſe; " When moſt contracted, it looks like a " little Ball, from one Part of which riſes " a ſmall Knob, not unlike what is com- " monly ſeen at the Head of a Lemon: This " is the Tail. and upon this the Inſect, in " this

" this Caſe, generally reſts. Oppoſite to " this is the Mouth, round which the Arms " appear regularly extended, and reſemble a " little Star, as uſually repreſented; all whoſe " Points ſeem to proceed from the ſame " Center. But when extended, the ſame " *Polype*, which, in the Poſition juſt deſcri- " bed, ſcarce appeared one tenth of an Inch " in Diameter, has drawn itſelf out to full " three quarters of an Inch in Length: In " which State the Mouth does, for the moſt " part, project like a ſmall and ſharp Snout " in the Midſt of the Arms."

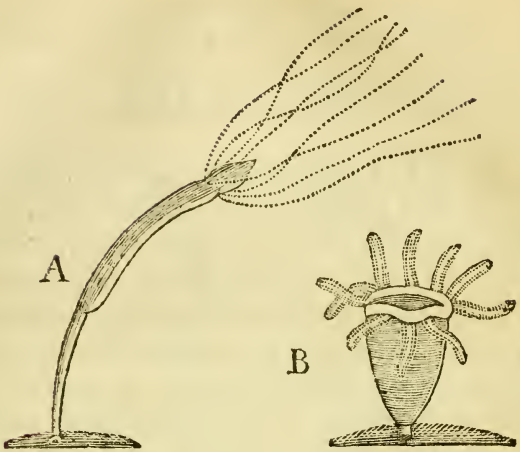
Although I do not pretend to have yet been able perfectly to diſtinguiſh ſuch, I have Reaſon to believe there may be certain minute Scales, or Protuberances, or ſome Sort of little *Spiculæ* or Hooks all over the *Polype*'s Body, which it can lengthen and protrude, or draw in and lay flat, occaſionally: for, if a Worm happens to touch any Part of the Body, one ſhall plainly ſee it catch'd and held faſt, one knows not how, till the Arms can be brought to fetter and convey it to the Mouth: the Worm too inſtantly begins to ſtruggle, and ſhews great Senſe of Pain, but can very ſeldom get away; which almoſt proves it muſt be held by ſome inviſible Hooks or Claſpers running into it, and which are probably of the ſame Sort as thoſe along the Arms.

CHAP.

CHAP IV.

Of the POLYPE'S *Head.*

WHAT I call the Head of the *Polype*, is that anterior Part which riſes in the Center between its Arms, and appears moſt commonly like a round Knob or Button; tho' ſometimes it extends beyond the Arms to a ſmall Diſtance, in a conic Figure, and at other times is ſo drawn in, as to be on a Level with them. The Term Head muſt not however raiſe an Idea of its being like the Head of other Animals, furniſh'd with Eyes, *&c.* (for this Creature has no Eyes that I have been able to diſcover:) but I call it ſo, becauſe here the Opening or Mouth is placed, whereby it takes in its Food. The Figure of this Part changes from time to time, according to the Diſpoſition and Wants of the Animal. When hungry, or going to ſeize its Prey, it puſhes out a Kind of Snout, and ends in a ſharp Point; but at the Time of ſwallowing, it forms a circular Mouth or Opening, that gapes and ſtretches much wider than one would imagine poſſible.



A. *Repreſents a* Polype *with its Snout and Arms extended, in the Poſture of ſeizing its Prey.*

B. *Shews a* Polype *contracted, with its Mouth wide open, and its Body like a Sack or Bag.*

We ſhall never, perhaps, be able to diſcover, certainly, by ocular Demonſtration, whether the Mouth of this Creature is really armed with Teeth; but we may conjecture it ſo to be, from the Eaſe wherewith it bites or breaks the Skin of a Worm, in order to ſuck the Blood and Juices: as, if the Worm be large, it is conſtantly found to do, till the Body is reduced to a Size capable of being ſwallowed. There is, likewiſe, a farther Probability of its having ſuch offenſive Weapons, from the violent and painful Agonies a Worm

a Worm expreſſes the Moment it is taken hold on by the *Polype*'s Snout, and from the ſudden Death that follows; which, conſidering the Nature of a Worm, and the Difficulty of killing it by pricking it, or even cutting it in Pieces, would almoſt incline one to imagine there muſt be ſomething poiſonous in the Bite; and that the *Polype*, as well as the Viper, does not only bite, but even inject a Venom into the Wound it gives, for the more ſpeedy Deſtruction of its Prey.

I have ſometimes forced a Worm from a *Polype*, the Inſtant it has been bitten, (at the Expence of breaking off the *Polype*'s Arms) and have always obſerved it to die very ſoon afterwards, without one ſingle Inſtance of a Recovery: wherefore you, SIR, and other curious Gentlemen, who have made the like Obſervations already, or ſhall hereafter make them, will, I hope, excuſe my Conjectures, as not wholly void of Reaſon, ſince in many Caſes we have no way of coming at the inviſible Cauſes of Things, but by arguing from their viſible Effects.

CHAP. V.

Of the POLYPE's *Arms.*

THE *Polype*'s Arms are of ſo curious and amazing a Contexture, that 'tis impoſſible to deſcribe the Pleaſure ariſing from viewing them before the Microſcope; without which no tolerable Conception can be obtain'd of their Beauty, Form, and Contrivance.

The Colour of them is white. They are diſpoſed in the moſt regular Order round the anterior End of the *Polype*, which I have called its Head, and when fully extended, command a Circle of ſeveral Inches in Diameter; into which if any Worm or ſmall Inſect ventures, it runs the ſame Danger that a Fly does, when within the Circumference of a Spider's Web.

The Number of Arms, in *Polypes* come to their full Growth, ſeems not fixt or certain, even in the ſame Species; and is very different as the Species differ. Thoſe from Abroad have generally 8 or 10, ſome 11, 12, 13, and even 14. The *Engliſh* Ones 4, 6, or 8, and ſometimes, tho' but ſeldom, 10. I never ſaw a *Polype* ſeparated from its Parent with leſs than 4 Arms. But whatever their Number be, they are placed at equal Diſtances in a Circle round the Head. They

are

are not however produced all at one Time, nor are always of the ſame Length one as another. Such *Polypes*, for Inſtance, as have 8 Arms when full grown, uſually put forth only 2 at firſt, directly oppoſite to one another: in ſome Hours 2 more appear, exactly between theſe: and ſhortly after 4 younger Ones riſe out between the other 4. So that till the laſt attain their full Growth, which requires about a Week, they are ſhorter than the reſt: and, indeed, it is difficult to know whether they are at laſt all naturally of the ſame Length, ſince they are often broken by Accident; and if not, their odd Contractions and Extenſions may deceive all our Obſervations in this reſpect, as they often contract ſome of their Arms at the Inſtant they are extending others †.

The general Form of a *Polype*'s Arm, when the Creature ſeems quiet and moſt at Eaſe, bears ſo near a Reſemblance to the Arm of a Star-Fiſh, that by examining the latter, we may form a reaſonable Conjecture of many particulars in the former, which by its Smallneſs we are uncapable of diſcerning perfectly. The Arm of a *Polype* is flat on one ſide, ſomewhat circular on the other,

† One ſhall ſee ſometimes a divided or double Arm, or an Arm growing from the Side of another Arm; but this muſt be regarded as a mere *Luſus Naturæ*.

and tapering from the Root to the Extremity. The flat Side is that directly forwards, whoſe Appearance makes it probable it may be furniſhed from End to End with Rows of little moveable Pipes or Suckers, as the Arms of a Star-Fiſh are: but this Conformation is not equally perceivable in every Kind of *Polype*; for the Arms, in ſome, diſcover very little of the Flatneſs above deſcribed; and I believe all Sorts of them can give a round Figure to their Arms, occaſionally, either in part, or in the whole. On the convex-ſide, and along the Edges, are numberleſs *Papillæ* or Protuberances, from each whereof two or three pretty long Hairs iſſue *: which *Papillæ* and Hairs, together with the moveable Pipes or Suckers, ſerve as ſo many Hooks or Claſpers to catch and hold its Prey, even before the Arm can bend itſelf to encircle and ſecure it perfectly.

The Arm being tranſparent, a moſt beautiful Arrangement of Articulations, not much unlike the *Vertebræ* of ſome Animals, may very plainly be diſcerned in it, with a large Veſſel like a Spine paſſing through them from the *Polype*'s Body to the Extremity of the Arm. Theſe Articulations, when the Arm

* Theſe Hairs were diſcovered by drying the Arms, and then examining them by the Microſcope: for when the Creature was alive, and the Arms moving in the Water, I could not be certain of them.

s extended, are ſeen at conſiderable Diſtances from each other; but when it is ſhortned they come quite cloſe together, and render it almoſt opake.

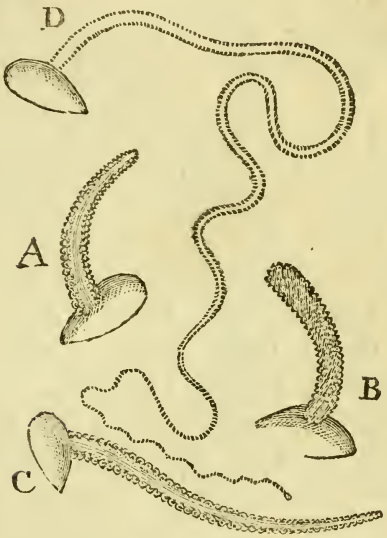
Your own Deſcription, SIR, of all this is ſo expreſſive, that I beg leave to copy it from the aforequoted *Philoſophical Tranſactions*, Page 427. " Each Arm conſiſts of ſeveral Rows of Knots or ſmall " *Papillæ* joyned together by a tranſparent " membranous Subſtance, and which is endued with a moſt exquiſite Power of Extenſion and Contraction: ſo as thereby to " bring any of thoſe Knots nearer together, or ſet them farther aſunder, and " that in every poſſible Direction, whereby " the Animal is able to bend any of theſe " Arms in any part, and all Sorts of Ways."

As the Arm is capable of great and gradual Extenſions and Contractions, its Appearance is very different in different Degrees of ſuch Extenſion or Contraction. When extended to the utmoſt Stretch, its Fineneſs is exquiſitely delicate, and it looks like a String of Beads, or knotted Thread, with the Beads or Knots widely diſtant one from another. When it is about half extended, it much reſembles the *Chenille* * Women uſe in their Works, which they erroneouſly call

* The *French* Word *Chenille* ſignifies a *Caterpillar*, and not a *Snail*.

Snail: and when quite contracted is very much like the Arm of a Star-Fiſh.

The following Figures will explain my Meaning better.



A. *Repreſents the Arm of a* Polype *contracted, and exactly like one of the* Radii *of a Star-Fiſh.*

B. *An Arm contracted in another Manner, and thickned at the Extremity.*

C. *An Arm about half-way extended.*

D. *The Arm of a long-armed* Polype *fully extended, with a little Knob or Button appearing at its End.*

It is impoſſible to tell what numberleſs Parts each of theſe Arms is compoſed of, all of

of which being in continual Motion, form together one of the moſt ſurprizing Sights in the World. The Strength of theſe Arms, the Purpoſes whereto they ſerve, and the Dexterity of the Animal in the Management of them, are alſo wonderful. They are employ'd both as Legs and Arms; for by means of them the *Polype* crawls from place to place, and with them he takes his Prey. The Variety of their Poſture, and the Extenſion of ſome ſorts of them from one Line to the Length of ſeveral Inches, is delightful and amazing.

His Grace the Duke of RICHMOND, in a Letter which you was ſo obliging to communicate to the *Royal Society*, ſays, if I remember right, That he ſaw ſome *Polypes* in Mr. TREMBLEY's Study at the *Hague*, hanging by their Tails to the Surface of the Water, in Glaſs Jars a Foot deep, and extending their Arms nine or ten Inches down into the Water. And I myſelf have frequently ſeen them three or four Inches long, even in our *Engliſh Polypes*, which are not, I believe, the ſame Sort as thoſe long-armed Ones of his: mine too would probably have extended their Arms much farther, if the Veſſels I kept them in had been as convenient for them, as Mr. TREMBLEY's were *.

* Mr. LEEUWENHOEK took notice of their being able to extend their Arms ſo ſurprizingly, that they ſeem'd, thro' the Microſcope, to be ſeveral Fathoms in Length. *Philoſ. Tranſact.* N°. 283.

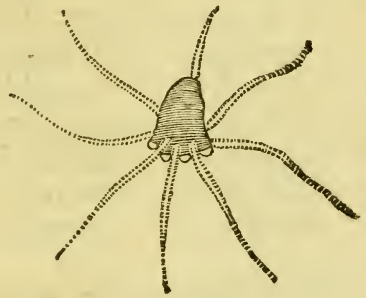
Another extraordinary Circumſtance is, that a *Polype* can extend an Arm in any Part of its whole Length, without doing ſo throughout, and can ſwell or leſſen its Diameter, either at the Root, at the Extremity, in the Middle, or where it pleaſes: which occaſions a great Variety of Appearances, making it ſometimes terminate with a ſharp Point, and at other Times blunt, knobbed, and thickeſt at the End, in the Figure of a Bobbin.

There are different Species of *Polypes* diſtinguiſhable by their Arms, ſome having them ſhorter and thicker, others more long and ſlender: ſome rounder, and others flatter. In ſome Sorts too there are little Balls or Buttons at the Extremities, more opake than any other Parts of the Arm, which at firſt View I was not wholly without ſuſpecting to be the Creatures Eyes, placed as a Snail's are at the End of its Horns; but my Obſervations ſince have not afforded any good Reaſon to continue ſuch an Opinion.

The Arms of all the *Polypes*, I have ſeen, are white, (except thoſe of the green Sort, whoſe Arms are alſo green, but paler than the Colour of the Body:) they are endued with a moſt exquiſite Senſe of Feeling, can bend either backwards, forwards, ſideways, or in any Direction, as eaſily as a Thread; and tho' extended to a great Diſtance, and ſcarce ſo thick as a fine Cobweb, are ſtrong enough to ſeize a Worm much bigger and more

more nimble than the *Polype*, and hold it ſo faſt it can hardly ſtir.

Between each of theſe Arms, when the *Polype* ſtands on its Head (as it frequently does on being removed into freſh Water) a Sort of fine Scale, like the Scale of a Fiſh, may be perceived projecting ſideways from it, as in the Figure.



In order to prove more fully what a great Similitude there is between the *Polype*'s Arms and thoſe of the Star-Fiſh, and indeed between the two Animals in general, I ſhall intreat your Patience, whilſt I lay before you the Subſtance of the Deſcription Dr. GREW gives in his Account of the Rarities of *Greſham College*, of ſome *Star-Fiſhes*, at that Time in the Repoſitory of the *Royal Society*.

He calls one Sort of theſe *Stella Marina lævior*, the *ſmooth Star-Fiſh* or *Sea-Pad*. It was ſent, he ſays, from the *Eaſt-Indies*, and, when alive, is of a Fleſh-colour. It hath

hath five Arms or Rays each an Inch broad, and more thon five Inches in Length. The Trunk not above an Inch and half in Diameter. The upper or convex Side is wrought all over with very little lenticular Knobs, almoſt like a *Chameleon*'s Skin, with ſmall Concavities interjected, like thoſe in Poppy Seed. Underneath, each Arm is furrowed, the Margins of the Furrows being ſet with a Kind of curious Fringe. The Margins of the Arms wrought with lenticular Eminencies ſet in a ſtrait Row, and beſprinkled as it were with little Centaury Seed.

Whoever has ſeen a *Polype* in the Microſcope, will be ſenſible how nearly this Deſcription anſwers the Appearance of its Arms.

He deſcribes likewiſe the *prickled Star-Fiſh*, or *Stella Marina hirſuta*. It hath five Arms, each Arm pointed, and alſo ſlender or narrowed next the Trunk, but ſpread in the Middle: two Inches and three Quarters long: the Trunk itſelf not above half an Inch Diameter. The upper Part hath a rough Shag of ſhort Prickles, the other of longer: where alſo the Arms are furrowed. Theſe innumerable Prickles upon their Arms are all moveable, as in the *Sea Hedge-Hog*.

As he proceeds to treat of other Kinds, he deſcribes among them, one whoſe Arms are ſet round about with little Knobs like Pins Heads, leſſer upon greater, and another Kind

Kind with Spikes upon its Arms, rang'd in certain correſpondent Orders.

He alſo gives an Account of the *Stella Marina arboreſcens*, or *branched Star-Fiſh*, taken in the *Weſt-Indies*. It is, he ſays, above a Foot Diameter. The Mouth in the middle is divided into five Lips. The Figure both of this and of the Trunk or Body is pentangular. The Diameter of the Trunk almoſt three Inches. The Sides grow thin from the Mouth to their Edges, which are ſo many exact *Hyperbola*'s. From the five Corners of the Trunk as many Branches being produced, are preſently each divided into two others, about an Inch in Compaſs; round, but by a double Row of little Knobs ſeeming to be ſquare. Each of theſe are again ſubdivided into leſſer and leſſer Branches, the laſt whereof are ſcarce thicker than a Horſe-hair. In Number, by a moderate Eſtimate, above a Thouſand.

As he ſwims, he ſpreads and ſtretches out all his Branches to their full Length; but ſo ſoon as he perceives the Prey within its Reach, he hooks them all in, and ſo takes it as it were in a Net.

This Sort of Star-Fiſh has a long Pipe or ſlender Body, extending from the middle of its Arms, like the Form of our little *Polypes:* and, when in the Sea, can certainly extend its Branches ſome Yards in Diameter. The fine Extremities of the Arms, are, when dryed,

dryed, extremely brittle, and from the Smallneſs of the Number here mentioned, were, I believe, many of them broken off in this Subject, ſince we are told, *Philoſophical Tranſactions*, N°. 57. That the Diviſions of the Branches in another of the ſame Kind were numbered as far as eighty one thouſand nine hundred twenty, and that when the Fiſh was alive they might probably have been diſtinguiſhed farther, all which ſlender Threads through their whole Length have Claſpers iſſuing from them *.

Deſcribing alſo what he calls the *Preke* or *Poulps*, POLYPUS. 'Tis, he ſays, *a naked Fiſh*, having eight Fingers or Arms, ſpread out almoſt like the Rays of a *Star-Fiſh*, and the Mouth in a Manner in the Middle of them. Their Arms ſerve them both to ſwim with, and to attack their Prey.

He remarks, that all *Stars* have their Mouths in the Middle; but doubts of what RONDELETIUS ſays, that they ſeem to have no other Paſſage for their Excrement. He adds, they take their Prey as the *Polypus*,

* One of theſe Fiſhes is to be ſeen, dryed and extended, in the *Royal Society*'s Repoſitory, but its tubular Body is taken away to make it lie flat, and the fine Extremities of its branching Arms are cut off, to bring it within the Compaſs of a Box whoſe Diameter is about fourteen Inches. It was taken in *Maſſachuſets Bay* near *Newfoundland*, and is ſaid, by a Writing on the Box, to have had 81,920 Branches.

and

and ſwim very ſwiftly, by ſtretching out or contracting their Arms at Pleaſure.

My dwelling ſo long on theſe Deſcriptions of Dr. GREW, may be, I hope, excuſable: as my Intention thereby is, not only to give a more diſtinct Notion of the *Polype*'s Arms than can any other Way be done; but to ſhew, likewiſe, that the general Reſemblance between the *Sea-Polypes*, or *Star-Fiſh*, and the Animal we are treating of, is ſo great, that we can ſcarce heſitate to look upon it as a real *Freſh-Water Star-Fiſh*, of which it is poſſible there may be as many different Species as in thoſe of the Sea Kind: and that all the Variety of Arms either as to Number or Structure, which are obſervable in the one, may in proceſs of Time be diſcovered alſo in the other.

Could we view theſe *Sea-Productions* in their ſeveral Actions of Life, as we do the *Polypes* in our Glaſſes, ſtretching out and pulling in their Arms, and ſeizing their Prey, the Similitude between them would, I make no doubt, be ſtill more remarkable than it appears in theſe dryed Ones.

CHAP.

CHAP. VI.

Of the POLYPE'S *Stomach.*

THE Stomach of a *Polype* is that Place which receives its Food: and the Paſſage thereto is an Opening between the Arms, which, therefore, I ſhall term the Mouth. This Mouth can open, occaſionally, extremely wide, and as well as the Stomach is perfectly ſuited to ſo voracious an Animal, for the ſwallowing and digeſting Worms and other Creatures much larger than itſelf.

When an Animal is reported to ſwallow Creatures larger than its own Size, an Explanation is highly neceſſary, or elſe, however true the Fact may be, one can ſcarce expect it ſhould obtain Credit. In order therefore to ſolve this Difficulty, it muſt be remembered, that every Part, every Fibre of this Animal, is capable of very great Extenſion: and by this means it is, that the Body and Stomach admit of being ſtretched out to ſuch a wonderful Degree, as really to receive and contain a Quantity whoſe Bulk is more than that of the whole *Polype* was before *:

* Something of the like Kind may be obſerved in Snakes and Lizards, when they ſwallow large Frogs, Toads, &c.

after

after which it neceſſarily appears proportionably ſwell'd and enlarg'd.

This convenient Stomach is alſo as ready to digeſt as to receive its Food: for after, a few Hours, the Pellicles or Skins of the Creatures devoured are diſcharged again by the Mouth, wholly diveſted of all their Juices, and as thin as the fineſt Cobweb; and then the Stomach contracts in its Diameter, but extends in Length, the *Polype* ſpreads out its Arms, and waits for another Meal.

The Bottom of the Stomach is ſemi-circular, and ſeems to terminate at the Beginning of what I call the Tail, where it is likely it may have ſome Opening into the ſtrait Gut that paſſes to the *Anus*; by which, as I before took notice, Part of the leſs groſs Nouriſhment may probably be diſcharged. I have frequently ſeen a Worm, preſently after it was ſwallowed, and before Digeſtion, lying double at the Bottom of the Stomach, and thereby ſhewing how far it reaches, as in the Figure.

Though I have frequently made Attempts, I have not yet been able to lay open the Body of a *Polype* in Water, ſo well as to diſtinguiſh its internal Structure; and, when out of Water, it contracts into a mere Lump of Jelly, without any Form or Parts, and is altogether unmanageable: I ſhall not, therefore, pretend to give any Account of what is within it, farther than to obſerve, that in one or two I have turned, the Inſide ſeemed much whiter, more ſpungy, looſe, and uneven than the Out.

CHAP. VII.

The POLYPE'S *natural Way of producing its Young.*

POLYPES produce their young Ones in a Manner very different from the common Way of all other Creatures yet known. There is no Appearance of Copulation, nor any Diſtinction of Sex amongſt them. Every one of them is prolific, and that as much if kept entirely apart from all others, as when ſeveral abide together.

The young One iſſues from the Side of its Parent, in the Form of a very ſmall Pimple or Protuberance, not bigger than the Point of a Pin; which lengthens and enlarges every Hour; in a Day or two puts forth Arms, becomes a perfect, though ſmall *Polype*, and ſeparates from its Parent.

All this is performed much ſooner in hot Weather than in cold: and after this Manner four or five are frequently protruded, and ſeen hanging to the Body of the old One all at the ſame Time: Theſe too as they drop off are ſoon ſucceeded by more. And what is moſt extraordinary, the young Ones themſelves often breed others, and thoſe others ſometimes puſh out a third or fourth Generation before the firſt fall off from the original Parent.

At the Beginning, the young ones have no Arms, and the Head-Part, then, appears like a round bald Knob; but in a little while two Arms puſh themſelves out, which not long after are followed by two more, and thoſe in a ſhort Time by others, till their whole Number is compleated in the order taken notice of under my Deſcription of the Arms.

No ſooner is a young One furniſhed with Arms, than it ſeizes and devours Worms with all poſſible Eagerneſs: nor is it an unuſual Thing to behold the young One and the old One ſtruggling for, and gorging different Ends of the ſame Worm together. Before the Arms come out, and even ſome time afterwards, a Communication continues between the Bodies of the Old and Young, as appears beyond Diſpute by the ſwelling of either when the other is fed. But a little before the young One ſeparates, when its Tail-End begins to look white, tranſparent, and ſlender, the Paſſage between them, I believe, is cloſed. And when the young One comes away, there remains not the leaſt Mark where it had been protruded.

After a young *Polype* once gets all its Arms, it alters indeed in Size, but neither appears to ſhift its Skin, or undergoe any of the Changes moſt other Inſects do.

I have ſeen young Ones puſhed out from moſt Parts of the Body, but ſeldom very near

near the Arms, or below the upper Part of the Tail. The moſt prolific Place of all ſeems to be at, and a little above, what I call the Bottom of the Stomach: all round which Part they ſometimes hang in Cluſters.

Two young Ones, now and then, come out of this Place ſo near together, that, even after their dropping off, they adhere to each other by the Tails; and being thereby unable to fix themſelves to any thing, are forced to lye at the Bottom of the Veſſel, where extending in a contrary Direction, they appear as one *Polype* with a Head at each Extremity: and they ſometimes ſtick thus together ſeveral Days before they ſeparate. I had two, ſome Time ago, which continued thus above a Fortnight, and were ſtretched out more than three Inches long. I have alſo known one of theſe two-headed *Polypes*, or *Amphiſbænæ*, (if I may ſo call them) produced by the puſhing out of a young one in the ſame Line with the Body, at the Place where a Tail has been cut off: And this Appearance, had I not conſidered the Caſe, might have ſo far deceived me, as to make me imagine a Head was produced where the Tail had been cut off.

Theſe Creatures in warm Weather puſh out their young Ones ſo ſurprizingly faſt, and multiply to ſuch a Degree, that, I believe, the Deſcendants of a ſingle *Polype* may, in

one Summer, amount to many Thouſands. But, at all Seaſons, a great deal of their Increaſe, in Number as well as Bigneſs, depends on their being well fed, and kept clean.

A great deal of Pains has been taken by my worthy and ingenious Friend, the Reverend Mr. HENRY MILES, of *Tooting* in *Surry*, F. R. S. to obſerve carefully the Progreſs of this Creature's natural Increaſe, in order to make ſome Calculation of the Numbers produced thereby within a certain Time. And as he has been ſo obliging to communicate to me the Reſult of this curious Experiment, in a Letter, dated the fifth Day of *September*, 1743, I ſhall now, Sir, have the Honour of laying it before you in his own Words.

" The ſingle *Polype*, ſays he, which was " put into a Glaſs by itſelf *July* 12. with two " Intentions, *viz.* that I might learn how " long-liv'd the Creature is, and at what " Rate it produces Branchers, is ſtill alive: " and goes on to produce at leaſt five in a " Week, one Week with another. But " becauſe this *Polype* had the Appearance of " a young One on it, when I firſt ſet it apart, " (which young One came off in three Days) " I was willing to make Trial how long it " would be before a ſeparated young One

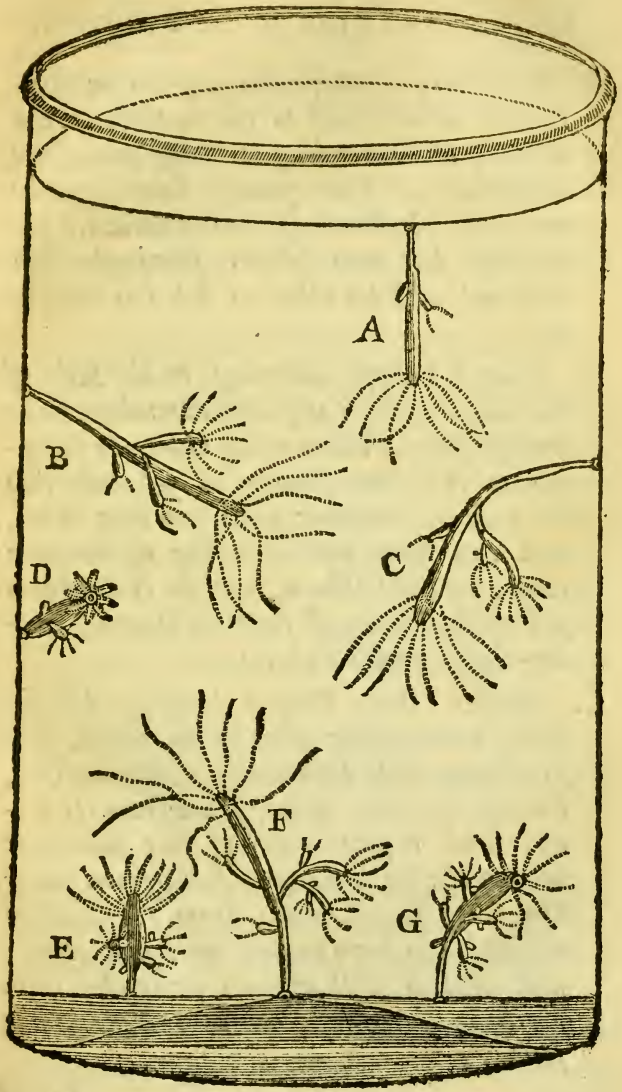
" might

" might be expected, provided the old One " had no Appearance at all of any one " thrusting out when it was set apart, but " was only of a moderate Growth. Ac- " cordingly I took such an One, a Branch- " er from the first, and put it into a Glass " by itself, *July* 23. And in a Week's Time " it produced One; and since that produces " at the Rate I mentioned before, five in a " Week. I was pleased to find, that the " two single Ones so exactly agreed in the " Number of their Productions, in the same " Space of Time; and as they continue to " do so, I suppose this may be allowed a " Sort of Standard. Permit me to observe " by the Way, that These are fed and shifted " but once a Day with the others; but I must " add, that they sometimes were gratified " with more Worms than One: for being in " single Glasses they are much more vora- " cious than those are which live in Num- " bers together. The fewer together, the " better they feed.

" Soon after I had separated the Second, I " sent to a Friend, well-skilled in Figures, " to desire him to make a Computation of " the Number which a single *Polype* would " produce in a Year's Time, if it could be " done: and on this moderate Supposition, " that a Week's Time being allowed for " every Brancher that is separated, e're it be- " gins to produce: it be supposed, afterwards,

" to produce One in three Days. But he " informs me, there is no Rule by which " ſuch Computation can be made; that it " is next to impoſſible to do it, without " ſpending more Time than he can ſpare; " and after all, Miſtakes may probably ariſe " in ſuch Multitudes of Figures as are ne- " ceſſary. However, he tells me, that he " went ſo far as to calculate the Number of " the ſecond Generation, which amounts to " Eleven Thouſand and odd. What then " muſt the whole amount to!"

The Appearance the *Polypes* make with their young Ones hanging about them, and all the other Particulars of their Production, will, I hope, be underſtood by the following Figures, drawn from a Glaſs of them which now ſtands before me.


A
B
C
D
E
F
G

An Explanation of the Figures.

A. *Repreſents a* Polype *hanging by an Air-Bubble at its Tail to the Surface of the Water, and extending its Body and Arms downwards. Two young Ones appear near the Bottom of the Stomach, one whereof has two Arms ſeemingly juſt come out, and the other as yet has none at all.*

B. *A large* Polype *adhering to the Side of the Glaſs by its Tail, and extending as in queſt of Prey. Three young Ones are hanging to it: One having as yet only two ſhort Arms; another with two long Arms, and two ſhort ones growing up between them; and the Third, which is probably juſt ready to drop off from its Parent, having eight handſome Arms.*

C. *Another large* Polype *hanging by the Tail, on the other Side of the Glaſs, and ſtretching itſelf downwards. A young One, having two ſhort Arms, iſſues from its Body; and oppoſite thereto, but ſomewhat nearer the Tail, hangs a full-grown young One with ſeven Arms; from the Side of which hangs down another with four Arms; and another ſtill appears protruded from the Side of the laſt, whereon no Arms are ſeen.*

D. *A* Polype *in its contracted State, faſtned to the Side of the Glaſs by its Tail, and having two young Ones: the biggeſt with ſix Arms, and the leaſt without any.*

E. *A* Polype *ſomewhat but not wholly contracted, ſtanding erect upon its Tail-End at the Bottom of the Veſſel. Six young Ones of different Age and Size hang round it.*

F. *A large extended* Polype, *raiſed upon its Tail and brandiſhing its Arms at the Bottom of the Water. A remarkable full-grown young One continues hanging to it: producing from its own Body one little young One having two juſt peeping Arms; and alſo a larger with four Arms, by which two more Young, one with four Arms, the other without any, are protruded. On the Parent* Polype *are alſo two more young Ones.*

G. *A* Polype *about half-contracted, whereon a Cluſter of nine young Ones of various Growth are ſhewn.*

As it will be no long Digreſſion, I beg leave to mention here another Creature, whoſe Way of bringing its young Ones into the World, is different from the common Courſe of Nature. What I mean is, the Toad or Frog of *Surinam*, which MERIAN gives

gives a Figure and ſome Deſcription of among her curious Drawings of the Animals of that Country.

The young Ones of this Toad are protruded out of its Back in their perfect Shape, after having been hatched from Eggs contained in certain Cells within the Skin.

Dr. RUISCH, in his Account of the Rarities in his own *Muſæum*, gives us two Figures of this Animal, which, he ſays, is like a Toad, and that many Eggs appear on the Back thereof, each incloſed in its particular little Cell or *Uterus*, out of which it at laſt burſts forth.

He tells us farther, that upon opening it, to ſee whether the Eggs did not come primarily from the *Abdomen*, and were only hatched in and puſhed out of the Back, the Caſe appeared to be the quite contrary; for he could not diſcover any Communication between the Eggs and the internal Parts of the *Abdomen*; but he found the Skin of the Back full of little Cells or *Uteri*, each containing an Egg, under a hardiſh *Operculum*, which being removed, it lay naked to the Eye *.

Mr. BRADLEY ſays, he has ſeen this Creature in the Cabinets of Sir HANS SLOANE, of Mr. VINCENT of *Haerlem*,

* Vide RUISCH. *Theſaur. Animal.* p. 19.

Dr,

Dr. RUISCH, and Mr. SEBA of *Amſterdam*, and has obſerved it in three different States. In the firſt, the Pores of the Back Skin were all cloſed; excepting three or four, which began to be forced open by the Eggs lodged in Cells below them. In the ſecond State, all the Pores in the Skin of the Back were ſo much opened, that he could plainly diſcern the Points of the Eggs within them. And in the third, (which he gives a Picture of) young Ones were perfectly formed in all the Cells of the Back †.

I have had the Pleaſure, SIR, on this Occaſion, to examine, in your Company, one of theſe Animals, which is very well preſerved in Spirits, in the Repoſitory of the *Royal Society*, and was given by his Grace the Duke of RICHMOND.—It much reſembles a very large Toad, being of the ſame Colour, and having little Protuberances like Pins Heads ſcattered over its Skin in the Manner our Toads have: but the Form of its Head differs from thoſe of *Europe*. On its Back, reaching from near the Shoulders to within a little of the *Anus*, are about two hundred circular Appearances, like dry dead flat Scabs, about half the Breadth of a Silver Penny, diſpoſed near one another in a ſome-

† Vide BRADLEY's *Works of Nature*, p. 126.

what

what regular Order, and forming all together a Sort of oval Figure. These are the *Opercula*, or Coverings of the little Cells, spoken of by RUISCH, and called Pores by BRADLEY.----Perfectly formed young Ones are seen issuing from two of these Cells: One has its Head and two Fore-Legs protruded, the hinder Parts remaining in the Cell; and the other thrusts out its two Hind-Legs, the Body and Head being left behind. A single Leg is likewise pushing out from a third Cell; but all the rest seem closely covered with their *Opercula*. The young Ones are much blacker than their Parent.

I am not suggesting any Resemblance between the Production of this Animal and that of the *Polype*, but instance it as another Extraordinary of Nature: and wish we could learn a little more of its *Coitus* and Organs of Generation, which in so large a Creature might be easily enough discovered.

A farther Example of the various Ways Providence has allotted for the Production of living Creatures, I lately had the Honour of being shewn by you, who are, I believe, the first Discoverer of it; and whom I have always found so willing to communicate every thing which may tend to the Improvement of natural Knowledge, that I assure myself of your Pardon for laying it before the Publick.

In

In the Months of *April* and *May* Abundance of little browniſh Eggs, about the Size of middling Pins Heads, and having each a Shell, were found in the Mud, amongſt the little red Worms wherewith the *Polypes* are fed. Theſe Eggs you examined by the Microſcope, which plainly diſcovered living Worms moving within each Shell. But the moſt ſurprizing Part of the Story is, that on breaking any of theſe Shells with the Point of a Needle, not only a ſingle Worm, as might be expected, but four, five or ſix, nay, ſometimes eight or nine minute, but perfect Worms, burſt out and crawled about nimbly: and it appeared, that each of theſe little Worms had been encloſed in its own proper Integument within the Shell, out of which it forced its Way at the Time the Shell was broke. Theſe Integuments are extremely thin and tranſparent, and may be diſtinguiſhed floating in the Water they are viewed in, or hanging about the Worms, which cannot ſometimes, immediately, get from them.

Here we find Eggs incloſed in Eggs, and ſeveral young Animals iſſuing from one Egg; Circumſtances very wonderful, and what I do not remember to have met with any Account of before among the Works of Nature.

CHAP.

CHAP VIII.

Where Polypes *are to be ſought for, and how to find them. The Manner of ſeizing their Prey deſcribed. Their Diſeaſes and Cures. How to feed, clean and manage them at all Seaſons. How they are affected by Air, Heat, Light, Motion. The Way of drying and preparing them for the Microſcope.*

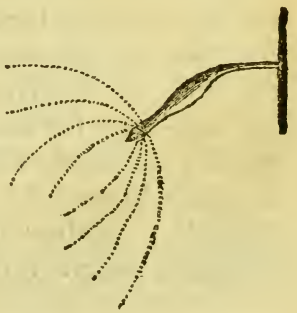
THE Waters where *Polypes* abound moſt, are not, as I am informed, ſuch as be quite ſtagnant, nor thoſe on the contrary, that have a ſtrong or rapid Stream; but ſuch as glide along with a gentle and ſlow Motion; where they may adhere to Stones, Sticks, or Plants, without the Riſque of being waſh'd away; and may have a Supply of Proviſion brought to them by the kindly Current of the Water. In Places like theſe, there can be no doubt, that they catch and devour many Sorts of ſmall Inſects, wherewith the Waters are peopled: but mine, that are kept in Glaſſes, (as I live in *London*, and therefore am unable to procure them ſuch Variety,) have been forced to feed on a kind of ſmall red Water-Worms, found plentifully in the Mud of the River *Thames**, and likewiſe, as I am

* When the Tide is out, theſe Worms riſe in ſuch Abundance on the Surface of the Mud, that it appears of a red Colour.

told,

told, in the Mud of many Ponds and Ditches. They have thriven however very well on theſe Worms, and their manner of ſeizing Theſe, is ſufficient to let us know how capable they are of doing the ſame thing by other Creatures larger than themſelves; for the Worms I ſpeak of have not only a great deal of Strength and Agility, but are many of them two or three Inches long, and conſequently as big as ſeveral *Polypes*. Notwithſtanding which, they ſcarce ever fail to kill, and very ſeldom to gorge them entirely, unleſs they happen to be uncommonly large: in which Caſe they ſwallow as much as their little Bodies can poſſibly contain, and leave the Reſidue hanging out of their Mouths.

When a *Polype* ſtands erect on the Bottom of the Glaſs, or hanging to the Side thereof, with its Body and Arms extended, as in the Figure, it is as vigilant as a Spider in the Centre of its Web, fully intent on Prey; and will ſeize a Worm with as much Eagerneſs as a Cat catches a Mouſe.



I have

I have often ſeen them thus ſituated, extending and waving their Arms in the Water, ſeveral Inches long, and ſo exquiſitely ſlender as not to exceed the Thickneſs of the fineſt Cobweb: yet their Senſe of Feeling is ſo delicate, that if a Worm touches even the utmoſt Extremity of theſe very ſlender Arms, they immediately lay hold of it, and contracting themſelves to about the middle Length between their utmoſt Extenſion and Contraction, by claſping their Arms about it, they invelop and fetter it in ſo many Places, and to ſuch a Degree, that notwithſtanding it be much larger and ſeemingly ſtronger than they, it is ſoon rendered uncapable of ſtruggling to any Purpoſe. In this Condition the *Polype* lengthens out its Snout *, and bites the Worm violently on one Side, which not only gives it a great deal of Pain, as its wriggling Motion teſtifies, but likewiſe makes the Blood run out: and it continues ſucking at the Wound till the internal Juices are ſo far extracted, that the Body of the Worm is reduced to a Size not over-large for the *Polype*'s Mouth, then opening extreamly wide, to take it in double; in which Manner it is ſwallowed, ſlowly and gradually, till the whole gets down into the Stomach; where it may be diſcerned thro'

* Vide *Page* 32.

the

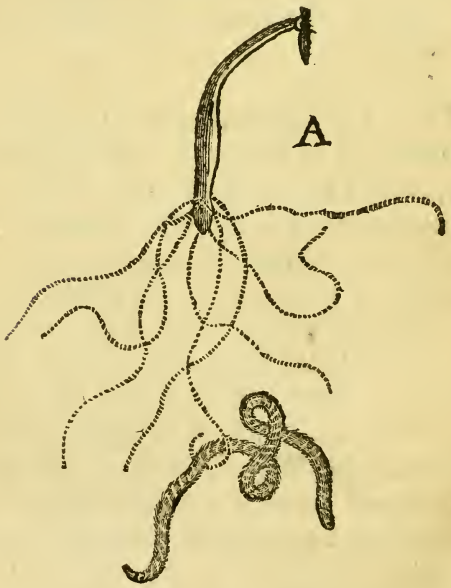
the Skin, lying folded as before deſcribed †, Page 47.

When the *Polype* is thus gorged, it remains contracted: its Arms hang down limber and motionleſs like wetted Threads; and it appears lazy, dull, and unactive for ſeveral Hours; till, having digeſted the Worm, it diſcharges the thin Skin or *Exuviæ* thereof upwards by the Mouth; after which it is ready to eat again, catches hold of whatever touches the Arms, and will not eaſily part with it.

'Tis a fine Entertainment to behold the Dexterity of a *Polype* in the maſtering its Prey, and obſerve with what Art it evades and overcomes the ſuperior Strength or Agility thereof. Many times, by way of Experiment, I have put a large Worm to the very Extremity of a ſingle Arm, which has inſtantly faſtened on it with its little inviſible Claſpers. Then it has afforded me inexpreſſible Pleaſure, to ſee the *Polype* poiſing and ballancing the Worm, with no leſs ſeeming Caution and Judgment than a ſkilfull Angler ſhews when he perceives a heavy Fiſh at the

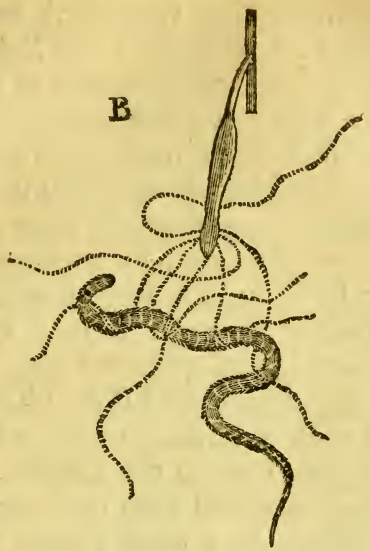
† The Blood of the Worm may be ſeen, very plainly, paſſing into the *Polype*'s Stomach, cauſing a Redneſs and Fullneſs there; and the Worm itſelf, even from End to End becoming pale, and almoſt colourleſs, before the *Polype* begins to ſwallow it.

End of a ſingle Hair-Line, and fears it ſhould break away. Contracting the Arm that holds it, by very ſlow Degrees, he brings it within the Reach of his other Arms, which eagerly claſping round it, and the Danger of loſing it being over, all the former Caution and Gentleneſs is laid aſide, and it is pulled to the *Polype*'s Mouth with a ſurprizing Violence.



A. *Repreſents a* Polype *hanging by the Tail, ſeizing and managing a large Worm with a ſingle Arm.*

B. *Shews*



B. *Shews the ſame* Polype *folding its other Arms about the Worm, drawing it to its Mouth, and lengthening out its Snout to bite it.*

The Worm, on its Part, is not without a Knowledge of its Enemy, or a proper Sagacity to endeavour its own Preſervation and Deliverance. The Minute it touches a *Polype*'s Arm, it ſtarts away with as much ſeeming Horror as a Man would do that ſhould tread upon a Snake or ſome other dreadful Creature. But if a Worm be thrown into the Midſt of a *Polype*'s Arms, it will often lye motionleſs, as though it were ſenſible *Polypes* would not meddle with dead Worms;

(which indeed they will not:) and ſeems ſometimes ſo far to deceive the *Polype*, that it neither ſeizes nor takes notice of it whilſt it remains quiet: but as that cannot be long, when it finds itſelf under a Neceſſity of moving, it commonly exerts all its Strength in a ſudden Struggle to get away; though rarely to any Purpoſe: for no ſooner does it begin to ſtir, than it is ſure of being ſeized, and whatever Strength it may exert, the *Polype* very ſeldom quits its Hold, but cunningly gives way to its Efforts till it can entangle it with its Arms, and by a fatal Bite put a ſpeedy End to the Diſpute. However I have now and then ſeen a very ſtrong Worm, ſeized by a ſmall *Polype*, break off all the *Polype*'s Arms by its violent ſtruggling, and ſo make its Eſcape.

Two or three *Polypes* often catch hold on different Parts of the ſame Worm, and each ſwallows down as much as he can get, which obliges them to continue for ſome Hours with their Mouths cloſely conjoined together: for they cannot ſeparate, till the Worm in their Stomachs is digeſted, and thrown out again at their Mouths.

I have many times remark'd, when four or five *Polypes* have been in the ſame Glaſs, that upon giving a Worm to One, all the reſt, preſently afterwards, have extended their Arms and Bodies, (though before they

were contracted) as if they knew that Food was not far off: but whether excited thereto by Seeing or Smelling, or ſome other way of Information, I ſhall not pretend to gueſs: no more than I ſhall to determine, whether it is Light or Heat, or ſome other Cauſe, that induces them to extend their Bodies and ſpread their Arms, when brought out of a dark Place into a light one, or placed near a Candle, as they are almoſt conſtantly found to do. Upon bringing a Worm towards them, I have likewiſe obſerved often, that they lengthen out and ſtretch themſelves forwards as much as poſſible, before ever it has touched their Arms. And, frequently, upon dropping Worms in the Glaſſes, tho' at a Diſtance from them, I have found 'em devoured, after a very little while; but whether the Worms moved to them, or they to the Worms, I cannot take upon me to affirm.

Mr. TREMBLEY feeds his *Polypes* with what he calls the *Pucerons d'Eau*, which I take to be our *Pulices aquatici*. In the Letter before mentioned from the Duke of RICHMOND, his Grace ſays, that upon Mr. TREMBLEY's flinging amongſt his *Polypes* ſome of theſe nimble Animals, he ſaw the *Polypes*, both old and young, ſtretching out their Arms, catching and devouring them with great Eagerneſs: and that he could tell what Number of them each *Polype* had eat, by being able to diſcern the black Eyes of

the *Pucerons* through the Skin of the *Polype*, and that in the Stomach of ſome he could diſcover five or ſix.

Theſe *Pulices aquatici* are plenty enough in many Ditches in the Country; and it is not improbable that in the ſame Ditches *Polypes* may be alſo found: the Way of knowing which is, to take out gently the Roots or Stalks of Water-Plants, Leaves, Sticks, Stones, or any thing elſe that lies below the Surface: and putting them in a Glaſs Veſſel full of Water, if there are any *Polypes* you will ſoon perceive them adhering by their Tails, and waving about their Arms. For when their Tails are faſtned to ſomething, as they moſt commonly are, they do not eaſily quit their Hold when in the Water, nor drop off, tho' what they ſtick to be taken out of it: ſo that Thouſands of *Polypes* may be hanging to the Weeds, Stones, *&c.* every where in the Water, and yet by meer dipping you may not perhaps find one. The Want of knowing this has been, I believe, the Reaſon of many Diſappointments in ſearching after them: for as they do not ſwim, and are very rarely looſe in the Water, taking up Water only can ſignify but little, unleſs by ſome violent Motion or other Means their Tails could be diſengaged; and even then, except they could be got up inſtantly, they would ſink to the Bottom, and fruſtrate all our Pains.

It is impoſſible to make ſuch Obſervations on theſe Creatures, kept in ſmall Glaſſes, and

within Doors, as would naturally preſent, could we bring them under Notice in the open Waters where they breed, and are living in their own Way. For ſeveral Months paſt, I have daily, with great Attention, been viewing and conſidering them as to their Forms, Motions, Contractions, Extenſions, Manner of Feeding and Increaſe, both with and without the Microſcope; which has enabled me to put theſe Remarks together: but I am ſufficiently convinced how defective they muſt be, for want of ſeeing the Animal in its more natural Way: and, therefore, how liable I am to be miſtaken in many of my Conjectures.

When they raiſe themſelves upright at the Bottom of the Veſſel, or adhere to the Side thereof playing their Arms, they ſeem in better Health than if they lye along at the Bottom of the Water, without fixing their Tails: though ſometimes ſingle *Polypes* that are very large, and frequently ſuch as have many young Ones hanging about them, will lye ſo for many Days together, and yet ſeem well enough. They often get to the Surface of the Water, by crawling up the Sides of the Glaſs, and there hang, either by the Arms or Tail, or lay themſelves along and float. But in either Condition they appear uncapable of ſinking: for if you plunge them in the Water, unleſs they are held down for a little while, they will inſtantly be at Top again. I can't be

ſure they crawl up the Sides of the Veſſel in queſt of Food; but thoſe I have obſerved hanging in the Manner abovementioned, have always been ſuch as I had Reaſon to imagine might be hungry, from not having eat for ſome Time before. I likewiſe find them, when ſo ſuſpended, very ready to ſeize whatever comes within their Reach, claſping with their Arms the Quill I manage them with ſo firmly, that it is difficult to get it from them, and a Worm that comes near them is certain not to eſcape. After being fed, they eaſily ſink to the Bottom, and continue there: but thoſe I have put down without giving them Food, I have commonly, in an Hour or two, found again at the Surface. Perhaps, when empty, the Air may inſinuate, and render them ſpecifically lighter than the Water.

However hungry they are, they never prey on one another; but, on the contrary, if ſeveral are in a Glaſs they ſeem to chuſe being near one another. I have often put a little *Polype* to a large One, that has been fully extended to ſeize whatever ſhould come within its Reach, and have conſtantly found, that it received it with great Gentleneſs, and as if it were afraid to hurt it.

Some Gentlemen have found their *Polypes* quite diſſolved in their Glaſſes, by not renewing

newing of the Water ſufficiently often: which is not much to be wondered at, ſince Fiſh will be the ſame in ſome Degree; that is, the Fins and Tail will mortify, and diſſolve into a ſlimy Subſtance, by being kept in ſtale Water: for ſtagnating Water grows putrid, and becomes a Kind of *Menſtruum* to all animal Subſtances infuſed therein; and the Water with theſe Creatures is rendered much ſooner ſo, by the *Fæces* they diſgorge into it, converted into a Kind of Slime, fatal to them if not cleared away: the *Mucus* from their own Bodies contributes likewiſe greatly thereto.

In ſhifting the Water, it is not enough to pour it off, but they muſt all be taken out, and the Veſſel rubbed clean from the ſlimy Sediment adhering to the Bottom or Sides: otherwiſe the Miſchief will not be effectually prevented. My Way has always been, every two Days, to looſen their Tails from the Sides or Bottom of the Glaſs; then ſhaking the Water gently round, I pour it and them into a *China* Baſon, whilſt I rub and cleanſe the Glaſs perfectly; after which filling it with freſh Water, I take them up one by one, with a Quill cut Scoop Faſhion, and replace them in the Glaſs. This may be thought a little troubleſome, but hereby I have been ſo fortunate as ſcarce to loſe a ſingle *Polype*.

When

When taken up with a Quill, they ſometimes cling to it by the Arms in ſuch a Manner as not eaſily to be diſengaged: the Way, then, is to let the Quill remain a Minute or two in the Water, till they quit their Hold, or you'll be in Danger of breaking their Arms off.

When an Arm is broke, it is quickly again repaired, but their appears for ſome Days a Swelling or Calloſity at the Place, which however wears away in Time.

On putting them into freſh Water, they likewiſe often faſten by the Arms inſtead of the Tail to the Side or Bottom of the Glaſs, and continue for ſome time in a very odd Poſture, ſo fixt, there is no removing them without Danger of injuring their Arms; therefore it ſhould not be attempted, for they will ſoon ſet themſelves right again.

Care muſt be taken, that the Water given them be of a proper kind: for all Waters are not agreeable to them, and ſome will deſtroy them quite. What is taken up, clear, out of ſome Ditch or Pond, the Water of a River, or any other very ſoft Water, may be put to them with Safety; but that which comes from a Spring, or Pump, or is in its own Nature hard or ſharp, gives them Uneaſineſs as ſoon as they come into it, prevents their thriving, makes their Arms fall off, and

(as

(as I have been informed) kills them in a few Days.

When they find themſelves in ſuch Water, their Arms and Bodies inſtantly contract as much as poſſibly they can; they faſten not by the Tail, or play their Arms, but continue cramp'd, or as it were ſqueez'd together: appear ſhrivell'd, white and lifeleſs, refuſe Food, and dwindle away to nothing.

On perceiving this, the Water ſhould be changed inſtantly; and even though it is ſo, they don't ſometimes recover themſelves in ſeveral Days.

But if the Water put to them is what they like, though, perhaps, the Motion occaſions them to contract at firſt, they'll quickly faſten their Tails to the Sides or Bottom of the Veſſel, extend their Bodies and Arms, play themſelves about vigorouſly, appear healthful and lively, and catch a Worm as ſoon as it comes within their Reach.

The Water of the *New-River* is what I give to mine: it agrees with them mighty well, and I am told the *Thames* Water does the ſame. But either of theſe Waters may be rendered much better for them, if it be let ſtand for a Day or two, till the Foulneſs ſubſides, and it becomes perfectly fine and limpid. For theſe Creatures love Cleanlineſs exceedingly; and if Water be thus prepared, they not only ſeem delighted with and thrive much

much better in it, but you may view them with more Pleaſure, and have not occaſion to ſhift it quite ſo often.

It is very common ſoon after their Water is changed, to ſee them diſgorge into it whatever was in their Stomachs: but they do this more immediately, if it be Pump, or Spring-Water, or of a Kind they do not like.

A great Inconvenience ariſes from Multitudes of minute Water Inſects, which, like Lice, crawl about the Body, Head, and Arms of the *Polype*, and ſeem to torment it exceedingly. Renewing the Water frequently is ſome Relief for this Evil, but the moſt effectual Way is to rub them off in clean Water with a ſoft Hair-Pencil, then take them out, and put them into other Water, and repeat this Operation two or three times. They may thus be made very eaſy for a while; but with all my Care, I could never preſerve them long free from theſe vexatious Vermin.

Theſe Lice are ſo numerous, and of ſo large a Size in reſpect to the *Polype*, that (as any Body will be ſenſible on viewing them through a Microſcope) they muſt give it great Uneaſineſs: for they ſeem as big in compariſon as *Beetles* would be to Us, and by crawling all over its Body and along its Arms, make it writhe and twiſt about, and

ſhift

ſhift its Poſture continually, and ſeem to torment it in ſuch a Manner as one cannot ſee without pitying the poor unhappy Sufferer.

If the Water wherein *Polypes* are kept be not often ſhifted, the Lice increaſe ſo prodigiouſly upon them, as quite to cover their Bodies, eat off their Arms, and devour them by little and little; which, I believe, has been the Fate of many that were thought to have been diſſolved.

The Figure and farther Deſcription of theſe Lice may be ſeen in the third of the following Experiments.

My *Polypes* were kept, at firſt, in ſmall Glaſs Veſſels, containing about two Ounces of Water each, with Mouths very near as wide as their whole Diameter. Such Glaſſes hold five or ſix of them very conveniently, admit their being put in or taken out without Danger of Injury, and are eaſily clean'd and repleniſh'd with freſh Water. But when the Creatures multiplied, by Cutting and otherwiſe, to ſeveral Hundreds, I procured ſome larger Glaſſes, of nearly the ſame Form, containing better than three Quarts of Water, and capable of holding an hundred and fifty or two hundred *Polypes*. In a Glaſs of this Size the Water need not be renewed ſo frequently, eſpecially if the *Fæces* be taken out from time to time with the feathered

End

End of a Quill, to which it very readily adheres. It is pleaſant enough to obſerve them in ſuch a Veſſel, hanging from its Sides, or erecting themſelves at the Bottom, all extending their Arms at the ſame time, and ſo occupying every Place, that as ſoon as a Worm is thrown in, three or four of them perhaps lay hold of it. This ſaves the Trouble of feeding each particularly, as in the ſmaller Glaſſes; for here I only fling in Worms, and let them take their Chance: but then it has this Diſadvantage, that all of them are not conſtantly fed, nor any of them ſo often as in the ſmaller Glaſſes; which prevents their growing large. And therefore I ſtill keep a few (as well as all under Experiment) in my little Glaſſes, where I feed them as often as they like to eat, and by ſo doing have ſome whoſe Bodies are very near three Inches in Length, when they extend themſelves: which, if I may gueſs by what I have ſeen of Mr. TREMBLEY's Obſervations, is longer than any of his, that are kept in very large Veſſels: and perhaps much longer than they would ever grow even in their own Waters. Theſe very large *Polypes* ſeldom faſten to the Sides of the Veſſel, or raiſe themſelves much from the Bottom; but lye along there, oppreſſed as it were with their own Bigneſs, and extending their Arms but little. Their Form is alſo commonly irregular. The largeſt I have ſeen have been produced

produced by Cutting; or, to explain myſelf better, the Tail-Ends of *Polypes* that were cut in two, tranſverſly, are become thoſe very large Ones I have been mentioning. The Head-Ends grow large alſo, but not in the ſame Proportion.

The beſt Way of feeding them is, to ſuit the Worms to the Bigneſs of the *Polypes*; for though the leaſt *Polype* will faſten on and kill a large Worm, it is unable to ſwallow it all, and what remains, hanging from its Mouth, ſerves only to foul and corrupt the Water the ſooner. If therefore a whole Worm ſeems too much, divide it between two. It is ſurprizing to behold how ſoon a *Polype* kills a vigorous nimble Worm: except by cruſhing, no way can put it to Death more ſpeedily. But there is no Certainty what Kind of Weapons this is effected by, though probably it may be armed with ſharp Teeth, as has before been mentioned.

The Worms they are fed with ſhould be well cleanſed from the Mud, and have freſh Water often given them, or they will ſicken, grow white, and mortify at the Tail-End; in which diſtempered Condition they prove poiſonous to the *Polypes*, and if eaten, will kill them. 'Tis beſt to put the Worms into clean Water every Time you feed them.

Polypes

Polypes ſeem not to want much Air: Numbers of them were brought from *Holland* in Glaſs-Veſſels cloſely ſtopp'd; and I have known them carried about (in the Pocket) whole Days, in a Phial corked cloſe, without receiving any Harm. Thoſe in my own little Glaſſes have conſtantly been locked up in a Book-Caſe, and yet have thriven much better than others kept more open: which perhaps is owing to the kindly Effect Heat has on them, as plainly appears by their being reſtored much quicker after Cutting, and producing young Ones in greateſt Abundance when the Weather is at the hotteſt.

In Summer Time, however, they may be kept in any Sort of Veſſels, or in any Place; but when the Weather is cold, ſmall Glaſſes covered with Paper, having only a few Pin-Holes pricked through it, and placed in a warm Cloſet or Cabinet, are beſt: and in a froſty Seaſon proper Care muſt be taken to prevent their being frozen. They remain commonly at ſuch Times contracted, unleſs when brought to a warmer Air: require cleaning and feeding much ſeldomer: appear more ſluggiſh and unactive, and breed but ſeldom: and as all their Operations are much ſlower, their Reproduction, after Cutting, takes up then likewiſe a much longer Time.

It may ſeem extraordinary to talk of any Creature's being affected by Light, in whom no Eyes are to be found, and yet this Animal plainly appears to be ſo; for after ſtanding a ſhort Time in the dark, it is uſually found contracted and without Motion: and when brought out of a dark Place into the Light, it ſcarce ever fails to extend its Body and Arms, and play them about briſkly.

When firſt I obſerved this, I apprehended, that as my Glaſſes were ſhut up in a cloſe Book-Caſe, the Change of Air and not of Light might be the Occaſion of it, and therefore put a Number of them in an open Veſſel, on the Top of a Cabinet; where (though they were not wholly in the dark) I found them moſt commonly contracted: and when I brought them to a better Light they conſtantly ſtretched themſelves out. I might add, that when they approach a Candle they always do the ſame; but, perhaps, it will be thence ſuggeſted, that Heat may be ſuppoſed to affect them rather than Light.

I ſhall not at all Diſpute whether of the two it is: but be it one or the other, it ſeems an undeniable Evidence, that this Creature is poſſeſſed of a moſt exquiſite Senſe of Feeling.

However, Mr. TREMBLEY has made an Experiment with the little green *Polypes*, which appears to be concluſive. He fitted a cylindrical Glaſs, wherein he kept a Num-

ber of theſe, with a Coat of thick Paper; out of which Paper he cut, on one Side, the Figure of a Chevron. Then covering his Glaſs with it, all Light was excluded, but what came through the ſaid Chevron. The Conſequence was, that all the *Polypes* in the Glaſs came and placed themſelves within this Figure: and whenever he turned it about, as he did ſeveral Times, they conſtantly removed their Quarters, and in a Day or two would every one of them be ranged in the Chevron on the other Side of the Glaſs.

Some Months ago, carrying a few *Polypes* about a Mile, in a Hackney Coach, in a Phial about half full of Water; the Jolting of the Coach, upon the Stones, daſhed the Water, continually, with ſo much Force againſt them, that when I came to my Journey's End, I found their Arms all broken off, and their Bodies much contracted, white, and motionleſs: and the Gentleman with whom I left them, told me, they did not recover, but ſeemed to diſſolve away.

As other People may poſſibly have met with the like Accident, without conceiving the Cauſe of it, I juſt mention this Caſe for their Information, and, by way of Caution, never to carry theſe Inſects on Horſeback, or in a Coach, without quite filling the Veſſel they are put into with Water; that it may thereby be prevented from daſhing ſo violently againſt them. How

How long the natural Life of this Creature may be, I cannot pretend to say, having as yet had none that have died with me *: nor am I able to tell how long it can live without Food; though probably it may be able so to do for some Weeks or Months. But of this I am certain, that it will gladly eat two or three Times a Day, in warm Weather, if it can get Worms so often; and, when it is fed frequently, will grow large, and produce young Ones in Abundance; whereas such as are kept long fasting, lose all their Colour and Substance, are very little prolific, and dwindle away to nothing.---When hungry and empty, they appear lank, white and transparent; when full, browniſh or reddiſh, from the Colour of the Food within them: and extend themselves much longer when hungry, than when full.

'Tis of Consequence to take notice, once for all, that the Form and Circumstances of this little Animal, and much the greatest Part of what I have related concerning it, cannot be perceived or judged of without the Assistance of good Glasses, and proper Conveniencies for placing it in Water, in

* Mr. MILES assures me, he has sometimes observed a *Polype*, adhering by its Tail to the Glass, in the usual Form, and in Colour very little paler than common, with Arms visible, but not greatly extended; which, on the Touch of a Pen, has instantly dissolved into a fine Vapour in the Water.

ſuch a commodious Manner, that it may move and exert all its Actions of Life with Eaſe and Freedom; and yet be ſeen with ſufficient Diſtinctneſs. My Apparatus for this Purpoſe was made by Mr. CUFF in *Fleet-ſtreet*; it anſwers exceeding well, and is very ſerviceable for any other Object that requires being viewed in a Body of Water.

But it is not ſufficient to examine it alive only: I have likewiſe killed ſome, dryed them, and put them between Talcs in Sliders; and by ſo doing have had the Honour to ſhew you Hairs on their Arms, and ſome other Particulars not perceivable whilſt they were living and in the Water.

Preparing them in this Manner is a little troubleſome, and requires ſome Dexterity: but when done, they are very curious Objects for the Microſcope, well deſerving the Pains they coſt. And as Nobody elſe, I believe, has got them dryed in Sliders, the Way I prepare mine is at the Service of thoſe who may be deſirous to poſſeſs ſo fine an Object.

I chuſe a *Polype* to my Mind, and put it in a ſmall concave *Lens* with a Drop of Water; where, when it is extended and the Tail fix'd, after pouring off a little of the Water, if the Quantity ſeems too much, I plunge it, *Lens* and all, into Spirits of Wine, in the Bowl of a large Silver-Spoon. Hereby it is inſtantly killed, the Arms and Body contracting, ſometimes more, ſometimes leſs,

at

at the ſame Time. I then rub it gently in the Spirits with a very ſmall ſoft Hair-Pencil, to clear away its Lice, which may be ſeen to fall off and lye dead at the Bottom of the Liquor.

Thus far the Buſineſs ſeems pretty eaſy; but all the Skill I am Maſter of could never enable me to take a *Polype* out of the Spirits, and extend its Body and Arms on a Talc; though I have deſtroyed great Numbers in attempting it. For the Parts immediately cling together, in ſuch a Manner, that it is not poſſible to ſeparate them again, without tearing them all to Pieces.

I bethought myſelf, therefore, of adjuſting them upon the Talc whilſt in the Spirits: and to effect this, I ſlip a Talc under the *Polype*'s Body lying in the Spirits; and diſplaying its Arms, *&c.* thereon with my Pencil, by the Aſſiſtance of my Nippers I lift the Talc and the *Polype* upon it gently out of the Spirits. Then holding it in my Nippers with my left Hand, I dip my Pencil in the Spirits with my Right, and therewith diſpoſe the ſeveral Parts to my Wiſh as near as I am able; at the ſame Time wiping away the Lice with my Pencil, if any are to be ſeen upon the Talc.

When all the Parts are rightly extended, I lay it carefully to dry, which it does very

ſpeedily, leaving the *Polype* ſticking to the Talc in the Manner it was diſpoſed.

The chief Difficulty now is over, but ſome Caution is ſtill needful to ſecure it ſafely in a Slider: for if another Talc be laid upon it in the common Way, all our Labour will be rendered fruitleſs by its being broke and ſpoiled. To prevent this Misfortune, as ſoon as the Talc whereon the *Polype* ſticks is let down into the Hole of a Slider, I cut three little flat Pieces of Cork, about the Bigneſs of Pins Heads and the Depth of the *Polype*, and gum them, in a triangular Poſition, partly on the Edges of the ſaid Talc as it lies in the Hole, and partly to the Ivory Sides of the Hole itſelf; by which Means, the upper Talc being kept from being able to preſs upon the *Polype*, it may be put on, and fixed down with a Braſs Ring, without any Fear of hurting it.

If you intend to dry a *Polype* in its contracted State, it may be put directly into the Spirits without uſing any *Lens*: but if you deſire it extended, you'll find the *Lens* quite needful.

Vinegar, Water wherein Salt is diſſolved, or Spirit of Wine kills a *Polype* immediately. But Spirit of Wine is fitteſt for this Purpoſe, as it gives a greater Firmneſs to the Parts, drys away from the Talc ſooneſt, and leaves no Soil or Smear behind it as the others do.

CHAP.

CHAP. IX.

Of Cutting POLYPES *aſunder, and their Reproduction: with occaſional Obſervations and Remarks.*

WE come now, SIR, to the moſt extraordinary Part of this Creature's Hiſtory: which is, that when cut into Pieces, each Piece can repair itſelf and become a perfect Animal.

As I have experienced this very often, I ſhall here juſt mention my Way of performing the Operation, and add a few general Obſervations thereon: leaving the more remarkable Particulars to be ſet forth in the following Experiments.

The Inſtrument I cut them with is a Pair of very ſharp ſmall thin Sciſſars.--When I intend the Section ſhould be acroſs, I commonly (according to Mr. TREMBLEY's Method) place the *Polype*, with a Drop of Water, in the Palm of my Left-Hand, and wait till it extends itſelf to my Wiſh: then ſlipping the Point of my Sciſſars underneath, I can eaſily divide it where I pleaſe. But if I deſign to cut it the long Way, which is beſt performed in its contracted State, I put it on a little Slip of clean white Paper in a ſmall Drop of Water: and when by touching

I have made it contract and lie according to my Deſire, I drain away the Water, whereby its upper and under Sides collapſing, it becomes ſpread the broad Way, and remains fixt upon the Paper; by which means, I obtain a great Advantage; for by cutting through both Paper and *Polype*, I can make the Section more ſteady and certain than I could otherwiſe do. The divided Pieces adhere to the Paper like a Jelly; and therefore I throw them inſtantly into Water, where in a few Minutes they fall from the Paper without any farther Trouble.

But if I want to cut a *Polype* before the Microſcope, neither of the above Ways will do. I am then obliged to place it in a concave *Lens* filled with Water, and to cut it in the beſt Manner I can: and it is very difficult to divide it longitudinally in this Manner, though eaſy enough to do it the croſs-way.

Though this Creature, as well as every other living Body, muſt undoubtedly be furniſhed with many Veſſels, through which ſome Kind of Fluid, abſolutely needful to its Life and Growth, conſtantly moves along; it muſt be acknowledged, that upon Cutting, not the leaſt Effuſion of Blood or *Ichor* can be perceived, even by the beſt Microſcope. But this will ſeem in no wiſe ſtrange, if we conſider, that the whole

Polype

Polype has little or no other Colour than what it receives from the Appearance of its Food through the Skin; that its Juices are perfectly colourleſs; (as is the Caſe of ſeveral other Inſects called, very improperly, *Exangues*, who have a circulating Fluid, though not of a red Colour:) and that an Effuſion of ſuch colourleſs Fluid muſt neceſſarily be undiſcernable, unleſs its Current were ſo conſiderable as to occaſion ſome apparent Emotion in the Water where it undergoes the Operation; which cannot be expected from the minute Veſſels of ſo ſmall an Animal. We muſt not, therefore, conclude as a Certainty, that no Kind of Fluid iſſues from the Wound, becauſe we are unable to ſee any: for though, at firſt, nothing is indeed perceivable, it is common after a few Hours to obſerve a Slime or *Mucus* adhering to the wounded Parts, and which iſſues, without Doubt, from the Veſſels that are cut aſunder, though in too ſlow a Manner, and too tranſparent, to be taken notice of. It is moreover evident, that all the Juices of this Creature are extremely viſcid: and, perhaps, to that viſcous Quality may reaſonably be imputed the Smallneſs of their Effuſion, and the ſudden cloſing of the Veſſels, or healing of the wounded Parts: ſomething of which may alſo probably be the Reaſon, why many other Animals, ſuch as Snakes, Eels, *&c.* live many Hours after they are cut in pieces; though

though from the leſs Viſcidity of their Juices, or the larger Dimenſions of their Veſſels, or both together, their Parts are unable to continue alive, and produce others, as thoſe of the *Polype* do.---'Tis not my Intent, however, to impoſe Conjectures on any body, and therefore leaving them, we'll proceed to real Facts.

'Tis become a common Queſtion, How long the Parts of a divided *Polype* will be reproducing what each wants to make it a perfect and compleat *Polype?* And the beſt Anſwer to this Queſtion is, that the Time will be longer, or ſhorter, according to the different Circumſtances of the ſeparated Parts, and in Proportion to the Warmth or Coldneſs of the Weather, to the Care taken of them, and perhaps to other Particulars we are unacquainted with. But in order to explain this a little more clearly, it may be proper to give a brief Account of what uſually happens to each of the divided Parts.

If, for Inſtance, a *Polype* be cut in two Pieces, acroſs the Body, the Head-Part will frequently ſeize a ſmall Worm as ſoon as it can be offer'd, and ſwallow as much thereof as its Piece of Body can be extended to contain; and yet, unleſs the Cut was made ſo near the Head that the Piece of Body thereto is extremely ſhort, none of the Worm ſo ſwallowed will iſſue out at the wounded End:

which proves that End is cloſed, or, in other Words, that the Wound is healed. But if any of it does puſh out, when fed immediately after cutting, as now and then happens in the above Caſe, the whole Worm will quickly be protruded, and the Sides of the Wound unite. When all this is performed, which frequently requires leſs than an Hour's Time, it plays its Arms, and (excepting its being unable to faſten or hang by the Tail-End) appears as well as any other *Polype*; and in a few Days produces a new Tail.

But the Tail-Part, where an Head is wanting, requires a longer Time to make ſo good an Appearance: for though it ſoon faſtens by the Tail, contracts, and extends, which are undoubted Tokens of its being alive, it is totally diſabled from eating till it produces a new Head, furniſhed with Arms to ſeize and hold its Prey; which, in cold Weather, requires a Week or more; but, in Summer, is often effected in three or four Days. As ſoon as the Arms come out, it will eat greedily, and may be reckoned a perfect *Polype*; and, if well fed, will grow longer and larger than thoſe that never were cut, but the Arms are generally ſhorter, and more blunted at the Extremities.

If a *Polype* is divided through the Middle, Length-ways, the two Halves will commonly erect themſelves on their Tail-Ends,

play

play what Arms are not cut off in the Operation (as ſome of them moſt frequently are) ſeize their Prey, and eat in an Hour or two's Time. And as the Food burſts not out of their Sides, though their Bodies are much diſtended therewith, but on the contrary they appear round, ſmooth, and without any Scar, we may conclude them perfectly healed.----This Way of Diviſion makes two *Polypes* of one in the ſhorteſt Time of any; for abating the awkward Diſpoſition of what Arms they have, and the want of a few more, both Parts in two or three Hours appear as fair and well as others that have ſuffer'd nothing. The Defect of Arms is repaired alſo in a few Days.

A *Polype* cut, tranſverſly, in three Parts, requires four or five Days in Summer, and longer in cold Weather, for the Middle Piece to produce a Head and Tail, and the Tail-Part to get a Body and Head, which they both do in pretty much the ſame Time. The Head-Part always appears a perfect *Polype* ſooner than the reſt, as was before obſerved.

In whatever Number of Pieces a *Polype* can be divided, each Piece (as I have found by repeated Trials) will re-produce all the Parts neceſſary to make it a compleat *Polype*, in a Time proportionable to the above Account, which may therefore ſerve as a Kind of Rule to judge by.

I have ſometimes divided a *Polype*, and waited till the Parts were again perfected, then have cut them in the ſame Manner I did the firſt; and as ſoon as each Diviſion was reſtored anew, have repeated the like Operation on thoſe alſo: and thus have proceeded, repeating my Diviſions and Subdiviſions, as faſt as the Parts wanting were re-produced, for four or five Succeſſions: and I do not know that one of them ever failed *.

'Tis indeed ſurprizing, to ſee Creatures multiplyed by ſuch Means as one would expect ſhould certainly deſtroy them: and what is ſtill more extraordinary, *Polypes* produced in this Manner grow much larger, and are far more prolific, in the Way of their natural Increaſe, than thoſe that were never cut. It is very common, when a *Polype* is divided tranſverſly, to ſee a young One puſh out from one or other of the Parts, and ſometimes from both of them, in a very few Hours after the Operation has been performed: and, particularly from the Tail-Part, two or three are frequently protruded, in different Places, and at different Times, long

* It has been obſerved by Mr. TREMBLEY, by ſome curious Gentlemen to whom I have given theſe Inſects, and by myſelf, that their Bodies ſometimes break or fall aſunder of their own Accord, reproduce what each Part wants, and make two *Polypes* of one.

before

before that Part acquires a new Head, and conſequently whilſt it can take in no freſh Nouriſhment to ſupply them with: and yet the young Ones proceeding from it, under theſe Diſadvantages, thrive as faſt, and ſeem as vigorous as thoſe produced by perfect and uncut *Polypes*.

Some Care and Method is requiſite in all Experiments to make them ſucceed well: and whoſoever would ſee the wonderful Reſtoration of theſe Creatures, muſt provide ſharp Sciſſars, and have a ſmall open Veſſel, filled with good River or Pond-Water, in Readineſs to put the Parts into the Moment they are cut aſunder; and that, eſpecially, when the Operation is performed on a Slip of Paper, where they will otherwiſe quickly become dry and occaſion a Diſappointment.

Nothing after this is neceſſary, but to ſhift their Water, clean their Veſſel at due Intervals, and heedfully obſerve that none of the little Pieces are poured away with it. If this be done, there is Reaſon to believe they will very ſeldom miſcarry, ſince amongſt all the Numbers I have divided, not a ſingle Piece has failed to produce a compleat *Polype*, the Tip of one Tail excepted. But all People are not equally careful, or fortunate, in making Experiments: and as, with ſome, whole *Polypes* have been diſſolved, the Parts

of

of *Polypes* would certainly have come to nothing, in the Hands of the ſame People, had they been cut to Pieces.

What Kind or Degree of Pain this Creature feels upon being divided, it is impoſſible to conceive or know: but we commonly find that the Parts contract themſelves immediately after the Operation; and a Sort of Tremor or quivering Motion may frequently be obſerved in them by the Microſcope. Beſides, as the Senſe of Feeling is ſo exquiſitely quick in the Arms, we cannot well ſuppoſe the Body to be without its Share. And yet, its eating ſo ſoon upon it, would almoſt induce one to imagine, either that the Pain is not very great, or that it is over inſtantly, or at leaſt that the Uneaſineſs of Hunger is more grievous to this Inſect than that of being cut aſunder: in the ſame Manner as Dogs, Cats, and ſome other voracious Animals, if hungry, will eat with Greedineſs, though they are ſo hurt or wounded, that we have good Reaſon to believe they muſt ſuffer acute Pain.

The Quivering or trembling Motion above mentioned, is more particularly to be diſcerned, when only a little Bit of the Tail-End is cut off: which ſeems to imply ſome extraordinary Senſibility in that Part; and reminds me of what I have often been aſſured, by People who ſaid they had frequently

frequently experienced it, that a ſmall Blow upon the Tail of an Eel, Viper, or other Serpent will kill it inſtantly; though it would live ſeveral Hours after being cut in Pieces.

Since this extraordinary Power of repairing itſelf, when cut in Pieces, has been diſcovered in the *Polype*, it was ſuppoſed, with good Reaſon, (as Nature in her Operations proceeds not by Fits and Starts from one Order of Being to the next, but by gentle and almoſt imperceptible Gradations) that other Creatures might be endued with a like Capacity: and, upon making the Experiment, ſeveral have indeed been found able to do the ſame.

A Water-Worm about an Inch and half long was diſcovered by Monſ. BONNET, which repaired itſelf after being divided; and Monſ. LYONET found another above three Inches in Length, which being cut into thirty or forty Pieces, every Piece became a perfect Worm.

Monſ. GUETTARD and Monſ. JUSSIEU, made Trials of a like Kind, at the Requeſt of Monſ. REAUMUR, as well on the *Urticæ Marinæ* as on *Star-Fiſhes* found on the Coaſts of *Poictou* and *Normandy:* and after the *Star-Fiſhes* had been broke and cut into ſeveral Pieces, they not only continued to live, but their Wounds were perceived to cicatrize

cicatrize and heal: The ingenious Mr. TURBERVILLE NEEDHAM, of *Twyford*, near *Southampton*, has performed the same Experiment with like Success, as he has informed the *Royal Society*; and Monsr. GERRARD DE VILLARS has seen the *Urticæ* on the Coast about *Rochelle* reproducing all the Parts cut away, and the *Star-Fishes* putting forth new *Radii* in the Place of those they had lost.

Monsr. REAUMUR and Monsr. BONNET have found some Sorts of Earth-Worms repair themselves likewise, but with much more Slowness and Uncertainty: and you, SIR, was lately pleased to shew the *Royal Society* four small Water-Worms, not only alive and vigorous, but in all Appearance perfect, which about three Weeks before had been the Pieces of two Worms cut in Halves, and sent to you out of the Country. At the same time you likewise shewed a Worm of the same Kind, that had been never cut, and also two other Worms, that seemed to differ from it only in being something shorter, which had been the Parts of a Worm cut in two Pieces by yourself about ten Days before, and which had repaired themselves in your own Custody.

It may now, perhaps, be expected, that I should bestow some Pains to determine, whether this Reproduction, is, or is not to

be called a Kind of Vegetation: but, SIR, it would, in my Opinion, be highly impertinent to waſte your Time in Arguments about that Matter, unleſs we knew a little better the exact Boundaries of animal and vegetable Life, and could certainly point out where one ends, and the other begins. Inſtead, therefore, of wrangling about Words, or entering on a Diſpute I am wholly unqualified to decide; and which, if I could clear it, is, I think, of no great Conſequence; I ſhall conclude this Chapter, and prepare the Way to my Experiments, by endeavouring from the whole of what has gone before to draw up a conciſe and plain Deſcription of the *Polype*.

The POLYPE is a little freſh-water Animal, whoſe Body extends or contracts itſelf, occaſionally, from the Length of an Inch or more, and the Thickneſs of an Hog's Briſtle or leſs, to the Shortneſs of a ſingle Line, with a proportionable Increaſe of Width. Its Form is round and tubular: having at one End the Head and Mouth, about which ſix, eight, ten, and ſometimes more Arms, of a moſt curious Conſtruction, are regularly placed like *Radii*. Theſe Arms can ſtretch out to conſiderable Diſtances, or contract, as the Body does; and ſerve, like a Net or Snare, to entangle little Inſects that come within its Circuit. At the oppoſite End is the

the Tail and *Anus*; and on this End it uſually ſtands upright at the Bottom of the Veſſel it is kept in, or adheres by it to the Side thereof.

Its moſt remarkable Parts are the Arms, Mouth, Body, Stomach, Tail and *Anus*; all which are diſtinctly repreſented in the Frontiſpiece to this Attempt.

It brings forth young Ones in great Abundance, and without any Copulation, by a Protruſion from its Body of minute Protuberances, which in two or three Days become perfect *Polypes*, and fall off from the Parent; after which they undergo no other Change. It may likewiſe be multiplied artificially, and in a wonderful Manner, by being cut in Pieces; every Piece repairing itſelf in a few Days, and producing whatever Parts are wanting to make it a compleat *Polype*.

It feeds on ſmall living Animals, ſuch as *Water-Worms*, *Pulices Aquatici*, or *Water-Fleas*, *Nymphæ* of *Gnats*, &c. and is more greedy and voracious than any other known Inſect: inſtantly ſeizing and devouring whatever of ſuch Kind is put within its Reach, and that almoſt at any Time it is offer'd: and when once it ſeizes any thing, it will ſooner loſe its Arms than let it go.

As it has no Eyes, 'twas neceſſary its Senſe of Feeling ſhould be extreamly quick; and

ſo we find it is, for on the leaſt Touch of its Prey, it catches hold of it, be it ever ſo nimble, and opening its wide Mouth, ſwallows it down, gradually, till its Stomach and Body are diſtended like a blown Bladder.

Its Digeſtion alſo is as remarkably ſtrong as its Appetite is ravenous, for in the Space of a few Hours, a Worm, *&c.* is reduced, by the Action of its Stomach, to a mere Pellicle, as thin as the fineſt Cobweb, and evacuated upwards by the Mouth.

In ſhort, the Vigour and Strength of Life this Creature is endued with, are, I think, ſufficiently ſhewn, by the former Particulars of this Diſcourſe; and the Experiments that follow, will, I believe, fully prove how tenacious thereof it is.

CHAP.

CHAP. X.

A COURSE of EXPERIMENTS on the POLYPE.

EXPERIMENT I.

Cutting off a POLYPE'S *Head.*

MARCH, 25, 1743.----About ſeven in the Evening, I cut a *Polype* in two Parts, tranſverſly, whoſe Body and Arms were, before Section, when extended to the utmoſt, near three Quarters of an Inch in Length.

In order to perform this Operation, I placed it in Water in a pretty deep concave Glaſs *Lens*, in which I likewiſe examined it in the Microſcope, both before and after it was divided.

I attempted to cut it pretty near the middle as it lay extended in the Water: but the Glaſs ſlipping, and the Creature happening to contract itſelf juſt at the ſame Inſtant, my Sciſſars wounded it as cloſe as poſſible to the Place where the Arms come out; and, not being very ſharp, I was forced to cut in the ſame Place two or three Times, before I could ſeparate the Head entirely from the Body.

This *Polype*, the Day preceeding, had ſwallowed a Worm above an Inch long, which it would not take at the Time I offered it; but having left the Worm in the Glaſs of Water with the *Polype*, though it had crawled to ſome Diſtance from it, when I came to look two Hours afterwards, I could not find the Worm: but from the ſwelling and ſudden Increaſe of Bulk in the *Polype*, I had good Reaſon to ſuſpect its having ſwallowed it. And I now diſcovered that the Fact was really ſo: for, upon this Diviſion, good Part of the Worm came, undigeſted, out of the Body or Stomach of the *Polype*, and was by me pulled away with the Point of a Pin, after I had viewed it with the Microſcope, and fully convinced myſelf what it was. I examined, likewiſe, the Head and Body thus ſever'd, by the ſame Inſtrument, and obſerved, that the Arms in the Head-Part contracted themſelves at firſt, and became as ſhort as I believe they could, in which Poſition they formed an exact Star with ten *Radii* or Points: but upon putting it in freſh Water, after about a Minute, the Arms extended very much. The Body-Part ſhewed alſo undoubted Proofs of Life, by becoming ſometimes longer and ſometimes ſhorter, exactly in the ſame Manner as it had done before Cutting.

All

All this was performed with great Care and Attention; the two Parts were immediately afterwards put ſeparately into Glaſſes of Water, and kept in the ſame Manner during the whole Time mention'd in this Account; and ſo were all the other Pieces of *Polypes* ſpoken of through the Courſe of theſe Experiments. A Precaution I judg'd neceſſary to prevent any Poſſibility of Miſtake.

March, 26.---I looked this Day ſeveral Times at each Part of the divided *Polype*. The Head (which had ſcarce a Hair's Breadth below the Circle where the Arms come out) reſembled very much a Star or Flower, with ten Points or Leaves, as in the Figure, A.

A

Theſe Arms by different Extenſions and Contractions gave evident Signs of Life.

The Tail-Part lay ſtretched out thus, B. It ſhew'd Tokens of Life, by ſometimes contracting, appearing plump, and being in Colour like a perfect *Polype*.

B

March, 27.---On this Day at 3 o'Clock in the Afternoon, the Head-Part had plainly

produced a Body of about one twentieth of an Inch in Length, and appeared in this Manner. The Arms played in the Water freely, and the whole, ſtanding upright, ſeemed like a ſmall but compleat *Polype*.

The Tail-Part continued moſt commonly ſtretched out, as in the Figure given yeſterday: but the End whence the Head was cut, appeared now quite rounded and ſmooth, and thicker than in any other Place. On one Side of the Body a minute Protuberance was obſervable, little bigger than the Point of a Pin, which I conjectured to be a young One ſprouting forth. Its whole Figure was thus.

I this Day offered a Piece of Worm ſeveral Times to the Head-Part, but it would not eat *.

March, 28.----The Head-Part appeared to Day little different from yeſterday as to Form, but ſeemed to place and rear itſelf on its But-End more readily: it likewiſe

* Its refuſing Food was probably owing to the Coldneſs of the Weather, which makes this Creature leſs voracious; for the Head-End of thoſe cut in hot Weather, ſeldom fails to eat, as ſoon as a Worm can be given to it. Some Cauſe of it may likewiſe be imputed to the exceeding Smallneſs of its new Body.

extended

extended and contracted its Arms and ſhort Body more frequently.

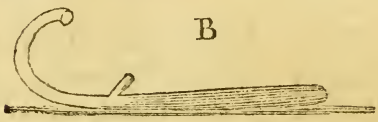
The Tail-Part extended to near three quarters of an Inch, appearing about the Thickneſs of an Hog's Briſtle, and lying as in the following Figure.

The End whence the Head was cut, lay conſtantly, till this Morning, groveling at the Bottom of the Glaſs, as in the former Draughts; but to Day it was commonly raiſed as much as in the laſt Sketch, and ſometimes a good deal more. The ſmall Protuberance I obſerved yeſterday was now conſiderably grown, and evidently a young *Polype:* and from that Production to the Extremity of the Tail appeared much whiter and more tranſparent than the reſt, or than it had done before, though ever ſince the Separation it had been the cleareſt Part.

March, 29.---The new Body produced by the Head-Part contracted and extended itſelf freely: when ſtretched out was more than the Tenth of an Inch in Length; fixed itſelf by the Tail to the Side of the Glaſs, play'd with its Arms, and ſeemed in all Reſpects a perfect, though ſmall *Polype:* but would not eat,

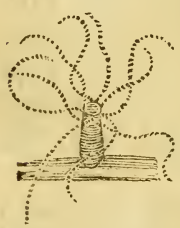
The

The Tail-Part was greatly extended moſt of this Day, as in the two annexed Figures, A B.

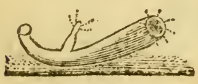


But ſometimes it lay contracted thus.

March, 30.---The Head-Part, which now appeared a compleat *Polype*, and nothing different from thoſe uncut, but in having Arms too long in Proportion for ſo ſhort a Body, ſtood erect all this Day, extending and contracting both its Body and Arms in the Manner of other *Polypes*.



It would not yet eat, though I ſeveral Times put Pieces of Worms within its Reach.



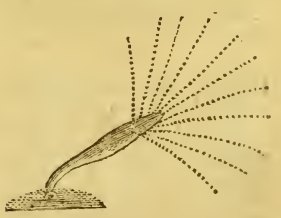
The Tail-Part lay to Day moſt frequently as in this Figure.

Its

Its young One appeared now conſiderably grown, and had four Arms: ſhort Arms were alſo diſcernable on its anterior End, which therefore I ſhall now conſider as a new-produced Head; but as I could not examine them by the Microſcope, without taking it out of the Glaſs, and was afraid the Preſſure or Motion it would receive thereby might prejudice the Experiment, I was unable to diſtinguiſh their Number.

In the Afternoon, I offer'd a Piece of Worm to this new Head, which made no Attempt to eat it: but the young One found Means to catch hold of it; and, what ſeemed very extraordinary, as the young *Polype* ſucked in the Worm, the Body of the Parent as well as its own Body ſwell'd, and became plump and bulky.

March, 31.--- The Head-Part and its new Body had now this Figure; and began to eat a Piece of Worm, but ſparingly.



A Sort of Slime or Jelly invelop'd the new Head of the Tail-Part this Morning, and rendered its ſhort Arms unable to ſeize or take hold of any thing. Its young One was grown much longer, and had ſix

Arms;

Arms; and another little One began now to appear, ſprouting out on the other Side.

April, 1. The new Body, produced by the Head-Part, appearing now ſtrong and vigorous, and in no wiſe different from my other *Polypes*, I deſiſted from obſerving it any farther at preſent; and applied my Attention to the Tail-Part, whoſe new Head being extreamly embarraſs'd with the Slime I mentioned yeſterday, I endeavoured to diſengage it, but with little Effect. It lay at the Bottom of the Glaſs all this Day, contracted, and unactive.

April, 2.---The ſlimy Matter continued to encircle the new Head, which appeared in a languiſhing State, from its Incapacity of eating any thing. The eldeſt young One extended its Arms and Body, but would not eat.

April, 3.---The Slime ſeeming to increaſe rather than diminiſh: and therefore ſuppoſing it to be ſome incurable Diſtemper, threatning the Life of the *Polype*, I placed it in the Palm of my Hand in a Drop of Water, at half an Hour paſt ten this Morning, and with my Sciſſars cut its new Head entirely off. Then replacing it in a Glaſs of Water, the two young Ones and the Parent Body extended themſelves greatly; and two Hours

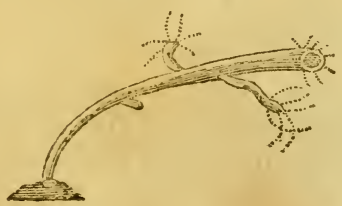
Hours afterwards, the eldeſt young One eat a Piece of Worm.

April, 24.---The Body-Part, from which I cut the new Head yeſterday, raiſed itſelf on the Tail, and appeared more lively than for three Days before; another young One appeared likewiſe ſprouting from it as the Figure repreſents; and four Arms were now evident on the ſecond Production.

April, 5.---The young One that ſprouted out yeſterday was grown to day conſiderably; and ſix Arms appeared now on the other young one which had then but four: every thing elſe remained as before.

April, 6.---All the young Ones extended themſelves much to day, and were very lively.

April, 7.----New Arms were diſcernable this Afternoon at five o'Clock, round the Part where a Head had been twice cut off: the young Ones were all three in a good Condition, and appeared together thus.

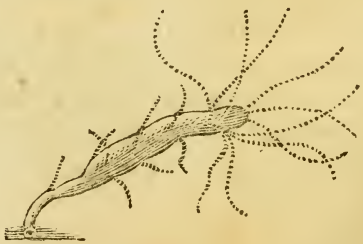


April,

April, 8.---The Arms on the new Head were this Morning much grown: in the Afternoon they extended greatly, and ſeized a Worm, which the *Polype* eat greedily; ſo that being now a perfect and compleat *Polype*, all farther Obſervations on this Part appeared unneceſſary.

The Weather during the Courſe of this Experiment was very cold.

April, 23.---I intended to make no farther Mention of the *Polype* produced from the Head cut off on the twenty fifth of *March*, as it has been, ſince the firſt Inſtant, a large and fine *Polype*; but now obſerving ſeveral Arms growing from its Body, in an unuſual Manner, I thought proper to give the Figure of it. Its Body was uncommonly irregular.



I have ſeen other *Polypes* with a ſingle Arm growing from ſome Part of the Body: but never any like this, with ſeveral Arms thereon.

May,

May, 8.---The Arms that appeared on the Body of this *Polype* ſwell'd, gradually, from the Root upwards, into fleſhy Protuberances, which, in a few Days, became young *Polypes*, and fell off in the uſual Manner: ſeven of the Arms have done thus ſucceſſively, and four other young Ones have been produced in the common Way: ſo that on this eighth Day of *May*, eleven have fallen off from their Parent: the Increaſe whereof, with five now hanging to the old One's Body, makes the number of thirty ſix perfect Animals, produced by a ſingle Head, ſince the twenty fifth of *March* laſt.

The Appearance of this *Polype*, with ſome of its Arms changing into young Ones, is ſhewn in the adjoining Figure, as drawn from the Microſcope.

EXPE-

EXPERIMENT II.

Cutting a POLYPE *in two Pieces, tranſverſly.*

APRIL, 1, 1743.----I cut a *Dutch Polype*, which had two young Ones hanging to it, quite through its Body, a little nearer the Head than where either of the young Ones came out.

I placed it in the Palm of my Hand, in a Drop of Water, and waiting till it extended, ſlipped the Point of my Sciſſars under the Body, and divided it a little above the upper young One, where the croſs Line deſcribes it in the Figure.

I then put each Part into a ſeparate Glaſs of Water, and obſerved That with the Head to it ſhewed a conſiderable Senſe of Pain, by a Kind of trembling and convulſive Motion in the Piece of Body thereto belonging. The other Half contracted, and lay without any Sort of Motion, from ſix in the Evening, when it was cut, till the Time I went to Bed.

April,

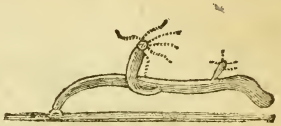
April, 2.---The two Parts of the *Polype* lay this Morning very quiet, but extended very much: the wounded Ends of both were conſiderably rounded and healed, and appeared in this Manner.

Examining them again in the Afternoon, the Arms on both appeared in Motion; and offering a Worm to the Head, it ſeized it greedily and eat it. The young One on the Tail-Part devoured likewiſe a Piece of Worm much longer than itſelf: after which, both were ſenſibly larger than before.

April, 3.---I found this Morning the *Exuviæ* of the Worms, evacuated by the two Parts of the *Polype* and lying in the Water. The wounded End of the Head-Part ſeemed now quite well, and it appeared as perfect as any other *Polype:* though it did not raiſe itſelf upright on the Bottom of the Glaſs, or adhere to the Side thereof by the Tail, as they uſually do; but continued lying in the ſame Poſture as yeſterday, only ſomewhat more contracted.

The Tail-Piece continued moſt of the Day extended thus. Neither Part would eat: occaſioned, perhaps, by their being full fed yeſterday.

April, 4.---The Tail-Part, with its two little Ones, lay to day in the manner ſhewn hereby, with Arms juſt appearing on the youngeſt of them.



The Head-Part erecting itſelf on the new Tail, and being now become a perfect *Polype*, requires no farther Notice.

April, 5.---The two little Ones on the Tail-Part extended much this Morning. In the Evening, the eldeſt of them ſeized a Piece of Worm larger than its Body could poſſibly contain. It ſucked in a Part, and its Body appeared greatly diſtended, the reſt of the Worm hanging out of its Mouth, as in the Picture.

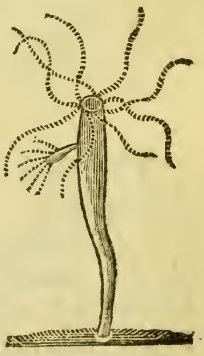
April, 6.---Part of the Worm continued hanging out of the young One's Mouth, from its not having yet digeſted and ejected what was taken into its Stomach yeſterday. At nine o'Clock this Morning, minute Arms were juſt diſcoverable on the anterior End, which,

which, therefore, I ſhall now term the new Head.

April, 7.--The *Exuviæ* of the Worm were now diſcharged, and the Arms on the new Head appeared conſiderably lengthen'd. The young Ones, this Morning, lay in a contracted State. Obſerving them again at Night, I found the largeſt of them ſeparated from its Parent, and extended greatly, in this Figure.

April, 8.----The Arms being now full-grown, and the new Head appearing compleat, I left off making any farther Obſervations.

It ſtood upright, in this Manner.



EXPERIMENT III.

A POLYPE *cut in three Pieces tranſverſly.*

APRIL, 13, 1743. I cut a *Polype* in three Pieces, by dividing it acroſs the Body in two Places. The Animal being ſmall, and contracting during the Operation, my Performance was not exactly to my Wiſh: for in cutting off the Head-Part four of the Arms were ſeparated, and the Diviſion was ſlanting, as in the Figure.

The black Line ſhews the Place of the firſt Section.

I then immediately ſubdivided the Tail-Part in two Pieces; whereof that next the Head-End, which I ſhall term the middle Piece, was extreamly ſmall.

The Diviſion was as the Figure ſhews.

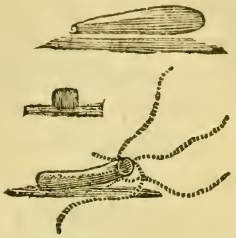
April,

April, 14.--- The three Parts appeared alive and plump.

The Tail-Part, thus, - - - -

The Middle-Part, thus, - - - -

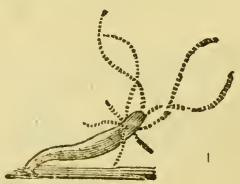
The Head-Part, thus, - - - -



Each Part was very ſmall; but the middle One, in particular, was not larger than a middle-ſiz'd Pin's Head.

April, 15.---All the Parts were much the ſame as yeſterday, excepting that the Head ſeemed a little longer, and the Arms that had been cut were evidently a good deal lengthened.

April, 16.---- The Head-Part to day eat a Piece of Worm: its Arms appeared longer than yeſterday, and its poſterior End was tapered like a Tail.

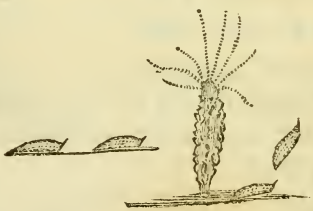


The Middle and Tail-Pieces appeared plump and well, contracting and lengthening at different Times, but as yet no Sign of Arms.

April, 17.---The Head-Part this Morning raiſed itſelf on the But-End like a per-

fect *Polype*; which it now, in all Reſpects, appeared to be, excepting that its Body was ſhorter, and its repaired Horns not quite ſo long as the reſt. It was moſt grievouſly tormented with minute Inſects; an hundred at leaſt crawling about its Body, Head and Arms*. They ſometimes launched into the Water, ſwam about for a while, and then returned to the *Polype*. Their Shape is ſomewhat like a *Millepes*, or *Hog-Louſe*. The Back riſes in the Middle, is ſpotted, and ſeems to be a Sort of Shell. The Head projects an elevated Noſe or Snout, which appears tranſparent. They creep along the *Polype* very nimbly, and when put from it into the Water, ſwim but awkwardly, with an unſteady and wabbling Motion.

The above Deſcription will be better underſtood by the Figures underneath.



Theſe Lice were taken notice of by Mr. LEEUWENHOEK at his firſt diſcover-

* See *Page 76.*

ing

ing the *Polype*. He ſays, that one of them which had brought forth two young Ones, had her Body laden with *Animalcules*, whoſe Shape was flat below and roundiſh above, and which he obſerved in moſt Waters; and that they were above a thouſand times leſs than the Creature they crawled upon, and hinder'd its moving. He ſaw likewiſe another *Animalcule* whoſe Body was almoſt round, teazing one of the *Polypes*, not only by running upon its Body, but by clinging ſo faſt to one of its Arms, that notwithſtanding all its Efforts to get rid of it, it could not ſhake it off: but he found at laſt that the Arm was loſt in the Scuffle †.

None of theſe Animals infeſted the other two Pieces of the *Polype*.

The Tail-Part fixed its End to the Bottom of the Glaſs, and lengthened itſelf, but no Arms were yet diſcernable: See A.

The Middle-Piece lay along, much lengthened, and rounded at each Extremity: See B.

April, 18.---The Arms of the Head-Part, which had been injured, were this Morning grown as long as the other. It eat a large Piece of Worm, and was as fine a

† Vide *Phil. Tranſ.* Numb. 283.

Polype as any I have. The other two Parts had no Appearance of Arms, but looked in good Condition, and were more extended than yeſterday.

April, 19.---The Middle and Tail-Parts ſeemed longer and better formed to day than they had yet done: but I could ſee no Arms.

April, 20.---This Morning little Arms began to ſhew themſelves both on the Middle-Piece and Tail-Piece: they ſtood on their poſterior Ends all this Day but would not eat. They appeared thus.

April, 21.---The Arms were this Morning conſiderably lengthened, and each Part eat a Piece of Worm with Greedineſs: ſo that now being compleat *Polypes*, I ſhall conclude my Obſervations on them.

EXPE-

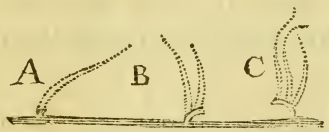
EXPERIMENT IV.

Cutting the Head of a POLYPE *in four Pieces.*

APRIL, 20, 1743. At ſix o'Clock in the Afternoon, I cut off with my Sciſſars one ſingle Arm of a *Polype*, with a little Bit of Fleſh thereto, ſcarce larger than a Grain of Sand: when magnified, it appeared as the Figure, A.

I cut off a ſecond Piece with two Arms, in the Figure, B.

And likewiſe a third Piece, on which were three Arms, in the Manner, C.



The fourth Part of the Head, which remained to the Body, had three Arms left on it, and two were cut from it in the Operation, cloſe to their Roots. It was a large *Polype* with a young One hanging to it. Immediately after the Cutting it contracted itſelf in an Heap, but in about half an Hour appeared as in the Figure below.

My

My Sciſſars had ſnipped a Slice away from one of its Sides, but that Piece was loſt: the Wound healed, and could not be found after a few Minutes.

April, 21.---The three minute Parts of the Head cut off yeſterday appeared plump, and ſhewed themſelves alive by the Motion of their Arms. The Piece of Head remaining to the Body ſeized half a Worm greedily. The Part with three Arms faſtened alſo on a Piece of Worm, though it ſeemed to have no Place to ſuck it into.

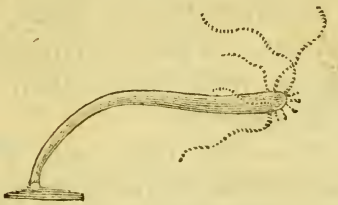
April, 22.---This Morning all the three Parts that had been ſever'd from the Head were apparently in a good Condition, and their Arms played briſkly in the Water. The fleſhy Root of each was become of a round Figure, and looked as in the Draughts.

The Roots of the Arms which had been cut on that Part of the Head remaining to the Body, were grown in their Length: and the Head itſelf appeared, at three this Afternoon, round and well, as in the Figure.

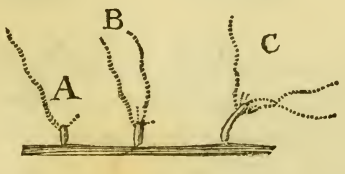
April,

April, 23.---All Appearances to day were little different from yeſterday.

April, 24.---Young Arms might be now diſcerned, ſprouting out on that Side the Head of the Parent *Polype* where the Arms and Fleſh had been cut away: the Arms growing from the two old Roots were likewiſe much longer than yeſterday: the young *Polype* drop'd off this Morning, and the Parent afterwards appeared thus;



The three Parts cut from the Head, now raiſed themſelves upright, each having a minute Body, and an Appearance of young Arms, as in the under Figures.



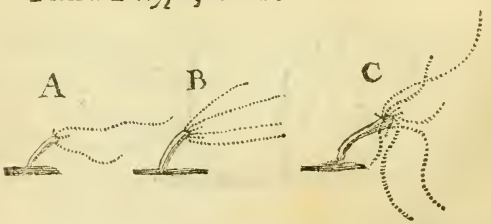
The Piece with one Arm appeared as, A.
That with two Arms, as B.
And that with three, as C.

April, 25.---All the Parts appeared to day grown, and in good Condition, excepting that with one Arm, which lay now contracted, and ſeemingly in a languid State: the new Arms on the Head of the old *Polype* were grown more than half the Length of its other Arms.

April, 26.---The Parent *Polype* was now perfectly reſtored, every Part of it ſeeming as compleat as before 'twas cut. The One-Arm-Piece recovered its Vigour, and had a perfect, but very minute Body, with two unequal Arms. The new Arms of the two other Pieces were longer than yeſterday. They all eat greedily.

April, 27.---My three new *Polypes* had each to day, at ten in the Morning, an Appearance of more Arms beginning to come forth.

Firſt *Polype*, as A.
Second *Polype*, as B.
Third *Polype*, as C.



I carried my particular Obſervations no farther; but they all became ſoon after as large and fine *Polypes* as any I then had.

EXPE-

EXPERIMENT V.

Cutting a POLYPE *in two Parts, lengthways.*

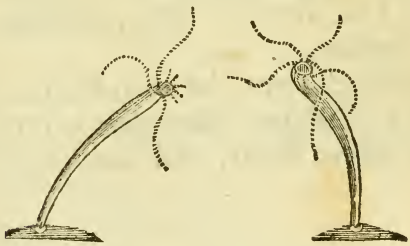
APRIL, 24, 1743.----In the Afternoon, at five o'Clock, I placed an *Engliſh Polype* in a Drop of Water on a Slip of Paper, and cut it the long Way from Head to Tail, in its contracted State: the Manner of its being divided will be underſtood by the Figure, where the black Line denotes the Place of Section.

I immediately put the two Halves in a glaſs Veſſel of Water, where they contracted for about half an Hour, and then appeared thus,

April, 25.--The two Halves were become this Morning, at eight, compleat *Polypes*, abating the Defect of the Arms. They rais'd themſelves upright on their Tail-End; and, what is very extraordinary, each of them appeared nearly as large as when they both made but one: and that even before they eat,

eat, which they did as ſoon as Worms were offered. Their Form was thus.

April, 26.---New Arms might be perceived ſprouting out from the Heads of both the *Polypes*, on the Sides where wanting. They diſgorged the *Exuviæ* of the Worms they eat yeſterday, and extended themſelves in the Manner underneath.



April, 27.---The young Arms were conſiderably lengthned. All this Day both *Polypes* hung to the Side of the Glaſs, extending their Arms and Body to a great Length. Each ſeized a Worm greedily.

April, 28.---The Arms were now grown to their full Length, and each *Polype* ſeemed as perfect as thoſe that were never cut.

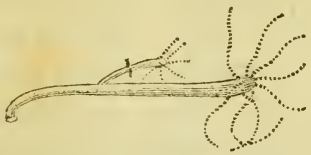
EXPE-

EXPERIMENT VI.

Cutting a young POLYPE *in two Pieces whilſt ſtill hanging to its Parent.*

APRIL 24.---Deſiring to know the Conſequence of cutting in two a young *Polype* before its Separation from the old One, I this Morning, at nine o'Clock, divided ſuch a young One with my Sciſſars, as it lay in my Hand, extended in a Drop of Water, as near its Middle as I was able.

It was an *Engliſh Polype*, and at the Time of cutting appeared as in the Figure, where the black Line ſhews the Place of Diviſion.



April, 25.---The Piece of the young One cut off, lay to day at the Bottom of the Water, extending its Arms, and lengthening its Body. The Parent adhered by its Tail to the Side of the Glaſs, ſtretching out its Arms likewiſe, as in queſt of Prey; but neither of them would eat, perhaps from having been full-fed about an Hour before the

the Experiment was made yeſterday. The wounded Parts of both ſeemed well.

April, 26.---The cut-off piece raiſed itſelf on the Tail. The old *Polype* hung to the Side of the Glaſs as yeſterday, and took a Worm with Eagerneſs. A Sort of Slime or *Mucus* iſſued from the Part where the young One had been cut off, and ſpread itſelf in the Water like a Film or Cobweb. Its Appearance was thus.

April, 27.---The Piece cut off, which I ſhall now call the little *Polype*, faſtened by its Tail to the Side of the Glaſs, played its Arms, and ſeized a Bit of Worm with Greedineſs. The Parent hung as yeſterday: Slime ſtill iſſued from the wounded Place; and directly over-againſt it appeared another young One juſt beginning to puſh forth.

The little *Polype* being perfect needs no farther Notice.

April,

April, 28.---The young Production of yeſterday appeared to day much larger. The old One continued hanging to the Glaſs Side, extended to a great Degree. The ſlimy Matter ſtill iſſued plentifully from the Place where the Cut was given.

April, 29.---Very little Alteration to day: all Appearances nearly the ſame.

April, 30.---No Arms were yet diſcernable on the Part where the young One had been cut off. I now found Means to get the Slime from it pretty well. The younger little One was grown as large as the Part of the elder cut one.

May, 1.--This Morning, at eight o'Clock, I perceived little Arms ſprouting out round the Place whence I cut off the *Polype* a Week ago, and alſo ſmall Arms on the other little One. Their Appearance was thus.

May, 2.---The Arms of both young Ones were to day lengthened conſiderably, and each greedily ſeized a Piece of Worm: ſo that being now perfect *Polypes*, any farther Account of them would appear ſuperfluous.

They both dropped from the old One two Days afterwards.

EXPERIMENT VII.

Cutting a POLYPE *lengthwiſe through the Body, without dividing the Head.*

APRIL, 24, 1743.--Mr. TREMBLEY having divided the *Polype*, from the Head, through the Body, to the Tail, but without cutting through the Tail, and thereby produced ſeveral Bodies conjoined by one Tail; I was deſirous of trying to divide One after a quite contrary Manner; *viz.* by cutting it lengthwiſe from the Tail to the Head, but leaving the Head uncut: in order to diſcover how two or more Bodies can be ſupplied with Food by one Head.

I therefore placed the largeſt *Polype* I had on a Piece of Paper, and whilſt it lay contracted, cut it quite through the Tail and Body, ſtopping my Sciſſars as near the Head as I could. This was done at half an Hour paſt ſeven in the Evening.

The

The Section was as the Figure ſhews.

In doing this ſome of the Arms were injured.

April, 25.---I found the Body I divided yeſterday conjoined again this Morning, at a quarter paſt ſeven o'Clock, without the leaſt Appearance of any Wound or Scar, but conſiderably ſmaller than before 'twas cut: though, giving it a Worm, which it greedily laid hold on and devoured, it ſwelled out as large as before: and excepting three Arms, that were ſnipped off in the Operation, it ſeem'd in nothing different from *Polypes* that were never cut.

April, 26.---Three new Arms began to ſhew themſelves where the former had been cut away: they continued growing in Length, gradually, till the firſt Day of *May*, when they appeared as perfect as any of the other Arms.

This was a remarkable Inſtance how ſoon the Wounds of theſe Creatures heal; of which I was pleaſed to find ſuch a plain Proof, tho' I became thereby diſappointed as to the Deſign of my Experiment.

EXPERIMENT VIII.

A Repetition of the foregoing Experiment, with different Succeſs.

MAY, 1.---The *Polype* made uſe of in the laſt Experiment having juſt eat a Piece of Worm, and appearing very large and fine, I put it on a Slip of Paper in a Drop of Water, and repeated my former Operation of cutting it the long-way from the Tail up to the Head, without dividing the Head. I performed the Operation at four o'Clock this Afternoon, as well as could be wiſhed, and upon putting it in a Glaſs of Water, in a few Minutes it had this Figure.

In about a quarter of an Hour, two little Pieces of Worm came out of the Wound alive, and wriggled about in the Water.

May, 2.---The *Polype* abovementioned placed itſelf all this Day with its Head down, and its hinder Parts upright, at the Bottom of the Glaſs, in a contracted State. The two Ends of the Tail were in contact, but a large Opening appeared between them.

This was its Figure.

May

May, 3.---I found the *Polype*, at ſeven this Morning, erect, on its Tail-End, in this Manner.

May, 4.---The Ends of the divided Tail appeared to day aſunder: it ſtood upright at the Bottom of the Glaſs, and extended itſelf as in the Figure.

Hitherto it had refuſed to eat, but now ſeized and devoured a Worm, which made both the Diviſions ſwell and enlarge.

I continued my Obſervations on it for ſome Weeks. It did not often care for eating, or thrive ſo well as my other *Polypes*, nor had it much Increaſe: it frequently ſtood upright and contracted, ſomething in the Shape of a Pair of Breeches, as the Figure ſhews.

A *Polype* I cut ſince in the ſame Manner at *Tooting*, for Mr. MILES, produced twenty-ſix in a Fortnight's Time, as he ſent me

Word; that is to say, after it began to produce, which was the third Day from its being cut, when two came off: and that Day Fortnight the Number amounted to twenty-six, which he then put among his other *Polypes*. This was in very hot Weather.

EXPERIMENT IX.

Cutting a POLYPE *in two Places, thro' the Head and Body, without dividing the Tail.*

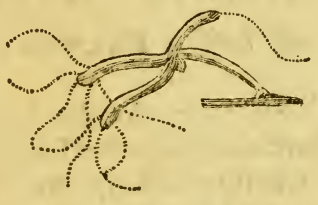
MAY, 1 1743. I cut an *English Polype*, longitudinally, through the Head and Body in two Places, but stopped my Scissars before they reached the Tail. I perform'd the Operation on a Slip of Paper, in the Manner the Figure shews.

May, 2.---The divided Head seemed to day a confused Heap of Slime and Arms, without any distinct Form: which Confusion was principally occasioned by Part of a digested Worm, which, on cutting, came out of the Stomach, and adhered to the wounded Head. Its Appearance was thus,

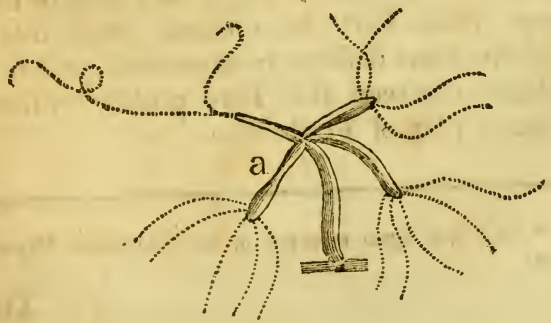
May,

May, 3.---It ſtill made an indiſtinct Figure; but I found Means to clear away the Slime from it, after which it lay along in this Manner.

May, 4.---The three Parts of the Head were to day very diſtinguiſhable, and each eat a ſmall Piece of Worm. A young One began to puſh out at the Side of the Tail where the Cut ended. Its Appearance was thus.



Its Form remained nearly the ſame, excepting the growing of each Part, till the ſixth Inſtant, when the young One(a) being perfect, I again examined it by the Microſcope, and found it to have the following Figure.



It will be obſerved, that the ſingle Arm on one of the Diviſions is exceeding long, and has another ſhorter Arm iſſuing from the Side thereof; a *Luſus Naturæ* I have more than once ſeen.

The young One, (a,) fell off on the eighth Inſtant.

EXPERIMENT X.

Cutting off half a POLYPE'S *Tail**.

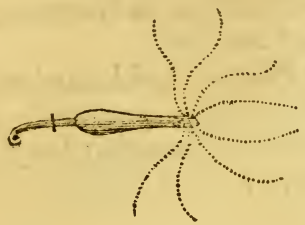
MAY, 11, 1743. As the *Engliſh Polypes* have a conſiderable Length of Tail, (eſpecially when extended,) thro' the Middle whereof the Microſcope diſcovers a long ſtrait Gut paſſing from the Stomach to the *Anus*, in the ſame Manner as it does in a *Lobſter*: I cut off this Tail at about half-way between the Stomach and its Extremity, to try if ſuch a minute Piece of meer Tail would become a *Polype*, as Pieces of the more noble Parts have done. And this I was the more deſirous to experience, as I had ſeldom obſerved this Part prolific in their natural Way of Production.

---

* This was again repeated in the Thirteenth Experiment.

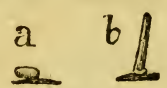
The

The Figure ſhews the *Polype* as it lay ſtretched out, and the Place where the Piece of Tail was cut off.



The Body-Part, immediately after the Operation, being placed in a Glaſs of Water, contracted and extended briſkly and often, and was ſeemingly in great Pain. The ſeparated Piece drew itſelf together, then lay entirely motionleſs, and appeared of a white Colour, as at (a).

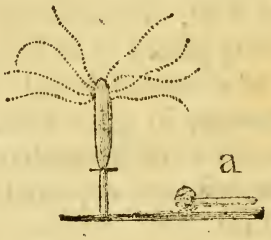
In about half an Hour, the Body-Part ſtretched out itſelf and Arms as it lay along, and ſeized a Worm as if nothing had happened to it: which Worm being lively and ſtrong, and the *Polype* unable to faſten by the Tail, the *Polype* was dragged by it from one Side of the Glaſs to the other. Soon after the little Tail-Piece fixed itſelf upright at the Bottom of the Glaſs, and extended itſelf as at (b),



May, 12.---This Morning I perceived two young Ones puſhing out, exactly oppoſite to each

each other, from the Body-Part of the *Polype*, juſt above the Beginning of the Tail, neither of which could be diſcerned yeſterday. It ſtood erect on its Extremity, which ſeemed healed and well.

The little Piece of Tail looked white, but well. It lay along extended, and the wounded End was ſomewhat ſlimy, as in the under Figure (a.)



May, 13.---The two young Ones were to day conſiderably grown. It continued in an upright Poſture, and the wounded End appeared more knobbed and like its former Tail.

The little cut-off Extremity appeared very ſlimy, and lay along in the ſame Manner as yeſterday.

May, 14.---Both the young Ones were grown: all Things elſe as before.

May, 15.---I found this Morning one of the young Ones had two pretty long Arms,

and two more that were ſhorter; the other had likewiſe two Arms, directly oppoſite to each other. They all extended as the Figure ſhews.

The Tail-End appeared ſtanding upright, but was very ſlimy, and ſo white and tranſparent as hardly to be diſcerned. See the above Figure, (a).

May, 16.---One of the young Ones dropped off this Morning and had ſix Arms, the other had now four.----The Slime was ſo increaſed about the Tail-Piece, that finding it impoſſible to diſengage it, and perceiving the whole Subſtance of it converting into a like Matter, I threw it quite away.

This Slime appears to be the worſt and moſt dangerous Diſtemper attending *Polypes:* for nothing ſeems to threaten them ſo much as Diſſolution, of which ſuch a *Mucus* or Slime is the Prognoſtic.

EXPE-

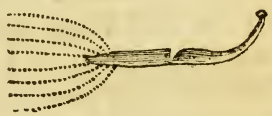
EXPERIMENT XI.

Cutting a POLYPE *tranſverſly, not quite through.*

MAY, 11, 1743. I cut a large *Polype*, when contracted, tranverſly, in the Middle, through about three Parts in four of its Body; in order to try whether the divided Parts would unite again, or if a Head, or Tail, or both, would be produced; or what would be the Conſequence of ſuch a Section.

The Cut was thus.

On putting it into Water, it lay at firſt in a Lump, and without Motion, at the Bottom of the Glaſs, but in about a Quarter of an Hour extended it ſelf in this Manner.

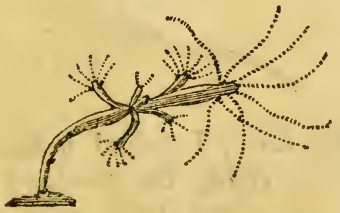


Soon afterwards it reared itſelf on the Tail, and played its Arms about: whereupon I offered it a Piece of Worm, which it greedily catched hold of; and viſiting it an Hour after, I found the Worm quite eaten up, the Body greatly diſtended, and the Lips of the Wound perfectly cloſed, but a kind

a kind of Stricture in the Place where it had been cut, which made the *Polype* appear ſmaller there than immediately above or below it.

May, 12.--It hung to day from the Glaſs's Side by the Tail, and appeared thus.

May, 13.---A young One puſhed out this Morning juſt where the Section had been made; the next Day another appeared cloſe by the former; and in three Days more, no leſs than ſix were ſeen, at, or very near the Place where the Cut had been; the Figure whereof was thus.



This and the following Experiment would induce one to believe, that Cutting renders theſe Animals prolific.

EXPE-

EXPERIMENT XII.

Cutting a POLYPE *obliquely, not quite through.*

MAY, 11.---At the same Time, I cut another *Polype* through the Body, in its contracted State, obliquely, but did not entirely separate the two Parts; with the same View as in the last Experiment. It hung together by a very slender Piece of Skin, and appeared thus.

In about a Quarter of an Hour it was extended in the Water, and lay along in this Manner.

An Hour after, I found it standing upright, the divided Parts conjoined, with only a Sort of Scar where the Cut had been. It played with its Arms, as in the Figure; whereupon I gave it a Worm, which it greedily catched hold of.

Two

Two Hours after this, the Worm was ſwallowed, and the *Polype* much diſtended. No Part of the Worm iſſued through the Wound, nor, indeed, did any Wound appear, but inſtead thereof a kind of double Body, as the Figure ſhews.

May, 12.---It ſtood upright on the Tail, all this Day, and appeared entirely perfect, but its Shape nearly the ſame as yeſterday.

May, 13.---A young One appeared to day where the lower Part of the Wound had been, and others came out at different Times, till the ſixteenth of this Month, when it lay extended with five young Ones hanging to it, in the Manner expreſſed by the Picture.

Theſe *Polypes* all came off at different Times, and there was a numerous Succeſſion of Others.

EXPE-

EXPERIMENT XIII.

Slitting a POLYPE *open, and cutting off the End of its Tail.*

MAY, 12, 1743.----I thrust the Point of my Scissars into the Mouth of an *English Polype*, as it lay in my Hand, contracted about half-way; and slit it down the Body, as far as to the Place where the Tail begins. Immediately afterwards, I divided the Tail of the said *Polype* in two, transversly, at about the Middle of its Length; which last Section was made, to try, once more, if such a Piece of meer Tail could possibly become a *Polype*; the *Tenth Experiment*, where it did not succeed, being in my Opinion not sufficiently conclusive, since the slimy Matter, whereby that Piece was lost, might possibly be an Accident that may not always happen.

This *Polype* had two large young Ones hanging to it, and at the Time of Cutting appeared thus.

This Figure shews the Slit along the Body; and the Cut across the Tail is express'd by the little transverse Line. Some of the Horns were shortened by the Operation.

On

On putting the Parts in Water, the ſlit Body lay in an Heap and motionleſs at firſt, but after ſome Minutes, the two young Ones extended, played their Arms about, and eat a Worm between them very greedily, each ſeizing on one End of it.

In a Quarter of an Hour the ſeparated Piece of Tail fixed itſelf on its Extremity, and ſtood upright, appearing plump, white, and extended.

The Body of the *Polype* was ſlit open at ſix o'Clock in the Afternoon: at nine it appeared perfectly healed, and no otherwiſe different from what it was before cutting, than by having a ſhorter Tail. It ſeized and eat half a Worm.

One of the two young Ones having fallen off ſince the Experiment, raiſed itſelf on the Tail, and eat the other Part of the Worm.

May, 13.---At eight this Morning, the Body I ſlit open yeſterday, ſeemed as free from any Wound or Scar as if nothing had been done to it, and it greedily eat a Worm. The Place where the Tail was divided appeared likewiſe quite well.

I obſerved a new young One puſhing out ſince the Operation, and found I had cut off

three Arms at that Time, five only being left. It had now the Figure A.

The Piece of Tail which had been cut off, fixed on its Extremity, ſtood upright, extended much, and appeared quite white and clear, as is ſhewn by B.

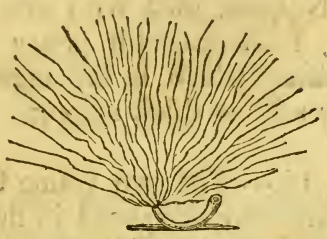
The young One that came off yeſterday, being now in no wiſe different from other *Polypes*, needs no farther Notice.

May, 14.---The Body-Part had the ſame Appearance as yeſterday, with this only Difference, that the injured Arms were grown ſomewhat longer, and the new young One a little larger.

This Morning the little Tail-Piece was clear, white, and generally extended: tho' ſometimes it contracted; but ſoon extended itſelf again. In the Afternoon it lay along at the Bottom of the Glaſs, in a ſemicircular Form; a Slime iſſued from the cut Place, and ſpread itſelf all over the Water, making it

ſeem

ſeem as if full of fine Threads or Cobwebs. Its Appearance was thus:



May, 15.--- The Arms that had been injured were this Morning grown almoſt to their former Length. The Head and Body-Part whereto they appertain, had not yet raiſed itſelf, or adhered by its poſterior End, ſince its Piece of Tail was cut off; but it eat heartily, and that End appeared pointed in an unuſual Manner.

The forwardeſt young One fell off in the Night; the other ſhewed two ſmall Arms; and a new Production was juſt viſible as in the Figure.

The Tail-Piece lay in the ſame Manner as it did yeſterday, but its Colour was rather whiter. The Slime continuing, I waſhed

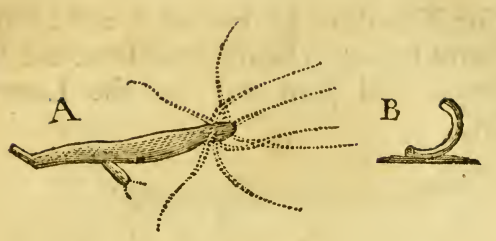
it in ſeveral Waters, and by rubbing it gently with a Hair-Pencil, and the Help of a Pair of Nippers, uſed with much Care and Caution, I diſengaged it pretty well therefrom; after which it lay contracted, and was very near as thick as long.

May, 16.---The two young Ones on the Body-Part were advanced in their Growth, as in the Figure A. The Tail-Piece appeared white and ſtood upright and contracted, as at B.

May, 17.---The largeſt young One pictured yeſterday on the Head-Part was fallen off this Morning; and the other ſo far grown, as to ſhew the Appearance of two Arms. A new Production was likewiſe puſhed out at the very Extremity of the poſterior End, and ſeemed (as all the Parts lay extended) to be merely a Continuation thereof. See Fig. A.

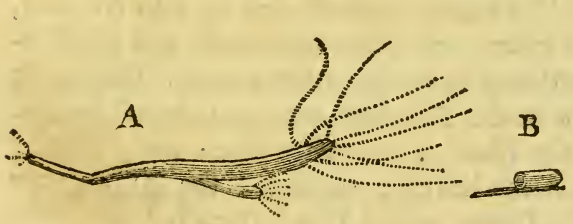
The Tail-Piece lay along as at B, looking white and clear, but I think ſomewhat more opake at the anterior End than it has appeared ſince it was cut off.

May,



May, 18.--At nine this Morning the Head-Part lay extended and looked very oddly, the Production at its Tail-End which I obſerved yeſterday having now four Arms, two longer and two ſhorter. The other young One had alſo ſix Arms. See Fig. A.

The Tail-Piece lay contracted, but ſeemed plump and well. See B.



May, 19.---The Head and Body-Part continued extended almoſt in the ſame Manner as yeſterday; but the new Production at its Tail-End was grown ſomething larger, and had now ſix Arms. The young One at its Side ſeemed juſt falling off; and a new Protuberance ſhewed itſelf, iſſuing out almoſt directly againſt the other, as in the Figure A.

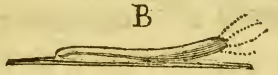
The Tail-Piece lay extended, and a couple of Arms began to be diſcernable at the End where it had been cut; as the Letter B ſhews.

A little Slime ſeemed troubleſome about the *Anus*.

May, 20.---The Head and Body-Part was this Morning extended in an odd Manner, the elder young One ſeparated, and the Production of yeſterday much grown. The young One at the Tail-End was now almoſt as large as the Head at the other End; and, playing its Arms briſkly, exhibited the Appearance of a *Polype* with a Head at each End; but, by cloſe Examination, a Line might be diſcerned, which plainly ſhewed them to be two *Polypes*, that might be expected ſoon to ſeparate. (See Fig. A.) They did not however come aſunder in above a Fortnight, but grew ſo large, that, when fully extended, they were three Inches in Length.

The

The Tail-Piece had now four Arms, and appeared in very good Condition, allowing for the Inconveniency of ſome Slime at its poſterior End, from which, with a little Trouble, I happily relieved it. See Fig. B.



In a few Days after this it grew very long and large, produced a great many young Ones, and became an exceeding fine *Polype*.

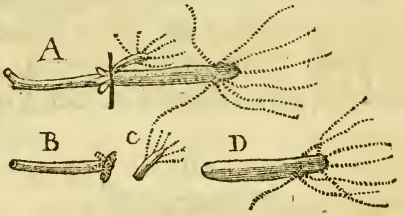
EXPERIMENT XIV.

Cutting a POLYPE *with four young Ones hanging to it.*

MAY, 25, 1743. I cut an *Engliſh Polype* in two, tranſverſly, at three in the Afternoon, exactly where the Tail joyns to the Bowels and Stomach; at which Place

four young Ones were ſprouted forth round the ſaid Part, one being well-grown and having ſix Arms, the others ſmall and of different Age and Size.

By this Section the eldeſt young One was ſeparated from its Parent, and the three younger Ones left to the Tail-End. Its Figure before cutting was as A. The Parts when divided as B, C, D.



The Head-Part in a Quarter of an Hour ſeized and eat half a pretty large Worm, after which it lay thus.

The Tail-Part extended itſelf greatly. The little One that was cut off ſeized a Worm about two Hours after.

May, 26.---This Morning, at 8 o'Clock, the Head-Part ſeemed perfectly well, but did not yet raiſe itſelf on the wounded End.

The Tail-Piece lay extreamly extended, as in the Figure A.

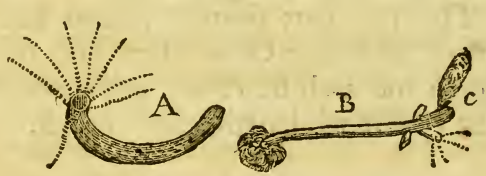
The young One cut off yeſterday appeared as at B.

The other Part of it remaining on the Tail-End, is ſhewn by C.

The

May, 27.---The Head-Part had not yet produced a Tail whereon to raiſe itſelf, but lay at the Bottom of the Glaſs, as at A.

The Tail-Piece, B, lay extended, but not quite ſo much as yeſterday; all its young Ones were grown, and the largeſt of them had now four Arms. A great deal of Slime iſſued from the Place C, where the young One had been cut off, and alſo from the *Anus*.

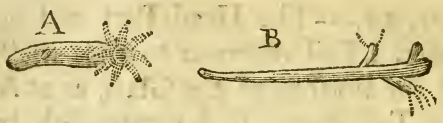


The young One's Tail being grown perfectly, it faſtened itſelf to the Side of the Glaſs thereby.

May, 28.---A young One began to appear this Morning near the Tail-End of the Head Part, which did not yet raiſe itſelf on its Extremity, but lay as in Figure A, and eat half a Worm greedily.

The forwardeſt young One on the Tail-Part dropped off in the Night: the other two had now acquired, one four, and the other a couple of Arms; the Part where the young

young One was cut off appeared with a round plump Head, but no Arms were yet diſcernable. See Fig. B.



The Slime was cleared away with a Hair-Pencil.

May, 29.---This Morning the Head-Part had puſhed out another young One, and lay extended as the Letter A ſhews.

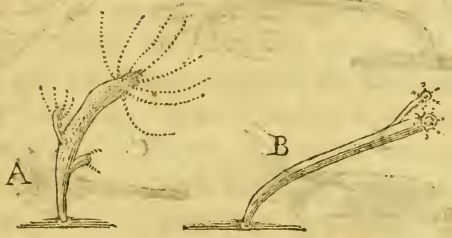
The Tail-Part ſeemed plump and well, one of its young Ones fallen off, the other grown and with ſix Arms, and the wounded Part very much lengthened. See B.

May, 30.---The two young Ones on the Head-Part appeared now with Arms; one had two, and the other four: and its poſterior End was become a compleat Tail, whereon it ſtood erect, as A.

The young One that appeared with ſix Arms yeſterday on the Tail-Part, dropped off this Morning: young Arms were juſt diſcernable on the anterior End of this Part,

and

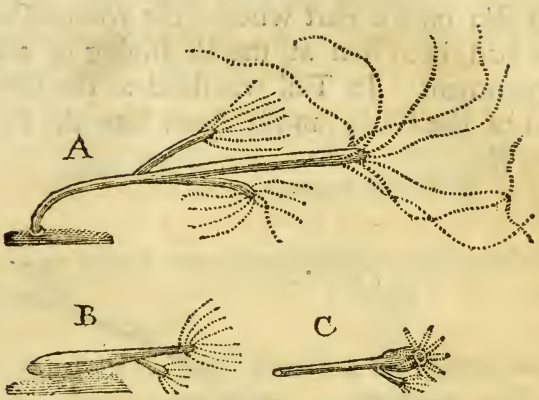
and alſo on the Part whence the young *Polype* had been cut at the Beginning of the Experiment. Its Tail was fixed to the Bottom of the Glaſs, and it ſtood like the Figure B.



May, 31.---The Body of the Head-Part appeared extended above an Inch and half in Length, with Arms exceeding long; its young Ones were likewiſe extended, as the Letter A ſhews, one having ſeven Arms and the other eight.

The new Head of the Tail-Part was now perfect, but the Arms not yet grown to their full Length. The cut young One thereto adhering was alſo compleatly reſtored.

This Part altered its Form ſeveral Times to day, appearing ſometimes as at B, and at other Times like C.



June, 1.--- The Head-Part was grown surprizingly, and extended more than yesterday, and both its young Ones were fallen off this Morning.

The young One on the Tail-Part was likewise separated from its Parent, which, being a compleat *Polype*, I observed no longer particularly: but only took Notice, in general, that all the Parts here mentioned produced afterwards a numerous Offspring.

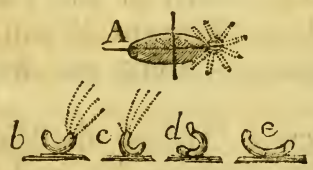
EXPE-

EXPERIMENT XV.

Quartering a POLYPE.

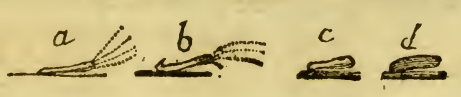
JUNE, 9, 1743. An *Engliſh Polype* being placed conveniently on a Slip of Paper, I cut it entirely through the Body and Head the long way, from Head to Tail: and then, turning the Paper, I gave it another Cut, tranſverſly, acroſs the Body; whereby it became divided into four Quarters, tho' not equal Ones. The Section is expreſſed by the Figure A.

Preſently after the Operation the four Pieces appeared in the Water as (b c d e).



The Experiment was made about four o'Clock in the Afternoon; and, at ten the ſame Night, each of the Fore-Quarter Pieces eat a Bit of Worm, and lay along extended in the Manner of (a b).

The two hinder Parts were contracted, but appeared plump and rounded, as (c d).

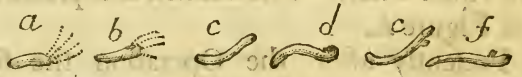


June,

June, 10.--The two Fore-Quarters played their Arms this Morning, and their Wounds seemed perfectly healed and well. They lay at the Bottom of the Glass as the under Figures (a b) shew.

The other two Parts extended themselves, and lay in the Manner represented by (c d).

In the Evening they lengthened out more than they had yet done, and a little Protuberance or young One might be discerned pushing out from each, as (e f).



June, 11.---Each of the Fore-Quarters seized and eat a Piece of Worm, and more Arms appeared coming out from each as (a b).

The young Ones on the Hind-Quarters were much grown to day, and little Arms shewed themselves just beginning to peep out on one of them. One of the said Hind-Quarters raised itself also on the Tail-End, but the other lay along in a Manner explained by the two Figures (c and d).

June,

June 12.---One of the Fore-Quarters devoured ſo large a Piece of Worm laſt Night, that it appeared this Morning moſt exorbitantly ſwelled, as at (a,) the other lay extended, as (b).

Young Arms were juſt diſcernable on the anterior Ends of both the Hind-Quarters, which now erected themſelves at the Bottom of the Glaſs, with their young Ones grown conſiderably, but one of them only furniſhed with Arms as yet. See (c d). They both catched hold of little Worms and eat them.

June 13.---One of the Fore-Quarters hung this Morning to the Side of the Glaſs, and the other ſtood upright at the Bottom; both extended themſelves, played their Arms vigorouſly, ſeized Worms as ſoon as offered, and were become perfect and fine *Polypes*, in no wiſe different from ſuch as were never cut.

The Arms that began to appear yeſterday, round the new Heads of the two Hind-Quarters were lengthened very much, the young Ones hanging to them were alſo well grown, and were both furniſhed with Arms, as in the Figures A, B.

The

They were now compleat *Polypes*, and produced a numerous Offspring, as did also the two Fore-Quarters.

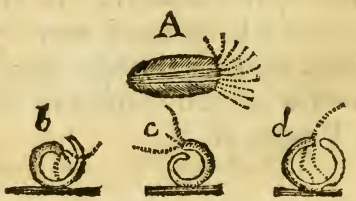
EXPERIMENT XVI.

Cutting a POLYPE *in three Pieces the long Way.*

JUNE 10, 1743. I divided a *Dutch Polype*, on a Slip of Paper, as it lay contracted, about four o'Clock in the Afternoon, in three Pieces, by cutting it in two Places quite through the Head and Body, lengthwise, as the Figure A represents.

Immediately after it was cut, the two Side-Pieces rolled themselves together, as at (b c).

The Middle-Piece made a perfect Circle, as at (d).



Some

Some of the Arms were injured in the Operation, but how many, or in what Manner, I could not, at preſent, be certain.

About ten at Night the two Side Pieces raiſed themſelves on their Tail-Ends, as at (a b.) and each of them ſeized a Bit of Worm and eat it.

The Middle-Piece lay along extended, and ſeemed exceeding ſlender in the Middle: it would not eat, but its Sides appeared healed, round and well, like the other two. Its Form is ſhewn at (c.)

June, 11.---One of the Side-Pieces was fixed by its Tail to the Side of the Glaſs at ten this Morning; the other ſtood upright at the Bottom of the Water: the Middle-Piece continued pretty much the ſame as laſt Night. All three extended and played their Arms with a great deal of Life and Vigour, and the Middle-Piece devoured half a ſmall Worm with Greedineſs, and was much diſtended thereby throughout its whole Length, Part of which however was ſtill much thinner than the reſt.

At ſeven in the Evening I gave a Bit of Worm to each of the Side-Pieces, who catched hold of it and eat it: they looked

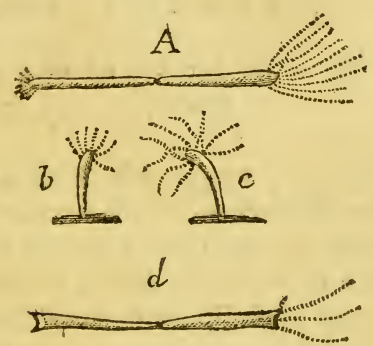
very well, and had young Arms beginning to appear between the old Ones. The Middle-Piece had alſo ſome new Arms, which made a pretty Appearance as it lay extended. It was much longer than the other two, and continued very ſlender and tranſparent in the Middle.

June, 12.--- This Morning an odd Appearance preſented; the Middle-Piece ſhewed Arms at each Extremity: that is, nine well-grown Ones at the Head-End, and ſeven ſmall Ones at the End that all along has ſeemed to be the Tail. It lay extended in a right Line, as the Figure (A) ſhews.

In changing the Water this Piece fell aſunder, in the Place where it had all along been very thin and tranſparent: both Parts of it, in an Hour after, erected on their Tails, played their Arms, and were perfect *Polypes*, though One a little bigger than the other: they likewiſe ſeized on ſmall Worms as ſoon as offered them with Greedineſs, and about two Hours afterwards appeared as (bc.)

'Tis very remarkable, that here are four *Polypes* from One cut into three Pieces; and I think, I can be very certain neither of them is a young One puſhed out in the natural Way. The Middle-Piece becoming Two is what creates the Difficulty; and the moſt rational Way of accounting for this is, by ſuppoſing that the upper and under Parts

Parts thereof, having nothing to hold them together on the Sides when cut, might separate in the Water immediately after Cutting, and only hang together by the Tail-End, as at (d.)



The Length and Shape of this Piece from the Time of Cutting seem suitable to such an Accident: and if it really was so, the Sides of each Part must have grown together circularly, formed a Body, and become a compleat *Polype*; and the Reason it was not discovered sooner must be, because the Arms of one Part were cut off in the Operation.

The other two *Polypes* formed of the Side-Pieces appeared very well, and were greatly swelled with the Worms they eat yesterday.

'Tis unnecessary to transcribe my Diary any farther: but, in a word, they all four

grew large *Polypes*, and in a few Days produced ſo many young Ones, that I was forced to remove them into other Veſſels.

EXPERIMENT XVII.

An Attempt to turn a POLYPE, *and the Event.*

JUNE, 12, 1743. Mr. TREMBLEY having aſſured us, in his Account of the *Polype*, that he has turned ſeveral of them Inſide out: ſo that their Inſide became their Outſide, and their Outſide their Inſide; in which Condition they did not only continue alive, but eat, grew, and multiplied as if they had not been turned; I was extreamly deſirous to attempt the ſame Experiment, though I knew not well which Way to ſet about it: but being ſenſible it muſt be effected ſome how or other by bringing the Tail and Body through the Mouth, and having the Honour of your Company at my Lodgings, about ſeven o'Clock in the Evening, I reſolved, SIR, in your Preſence to try what I could do.

For this Purpoſe, therefore, I employed a very ſlender Needle and the fineſt Thread I could get, at the End of which I made a ſmall Knot: and placing a large full-fed

Polype

Polype on a Slip of Paper with a very little Water, I thruſt the Needle in at its Tail, and directed it through the Body and Mouth, in hopes that by the Aſſiſtance of the Knot I might be able to pull the Tail and Body through the Mouth.

But though I conducted the Needle and Thread with the utmoſt Care and Gentleneſs, I could not ſucceed in my Deſign; for the Roughneſs of the Thread, as it was drawn along, tore or rubbed away the ſoft and delicate Body of the *Polype*, the whole whereof adhered to it like Birdlime, leaving nothing viſible but the Arms: which being deſirous to ſave, I cut off the Thread with a Pair of Sciſſars, cloſe to the Place where it paſſed between them, and then, putting them in Water, eaſily pulled away the other Part of the Thread.

When they were perfectly diſengaged, I placed them before the Microſcope in ſome Water, and found that the Needle and Thread had paſſed between them, exactly thro' the Center, where they had left a large Hole; that all the Body was entirely gone; and that nothing remained but merely a round Ring or Circle, with nine Arms (the Number I obſerved at the Beginning of the Experiment) iſſuing therefrom. The Figure it made was thus.

Though these Arms extended but little, they proved themselves alive by their continual Motions.

June, 13.--- The Circle appeared this Morning at eight, with all its Arms extended and playing briskly in the Water. The Hole in the Middle was somewhat lessened, but far from being closed. See the Figure.

Upon offering a Worm, it was surprizing to see with what Strength and Greediness it clasped its Arms round it and held it fast. The Worm struggled very much, and tumbled it up and down with much Violence; but it quickly killed the Worm, and seemed to suck out its Blood, leaving it pale and colourless, though it had no Place to contain any thing, unless the Circle and Arms may be supposed capable of drawing Nourishment therefrom. And, indeed, if my Eyes, or my Imagination did not greatly deceive me, they were after this much plumper and darker than they had been before.

June, 14.---The Hole, where the Needle had gone between the Arms, appeared not open this Morning, but like the Head-Part of other *Polypes:* the Arms themselves extended and contracted several Times, but lay com-

commonly in the exact Figure of a Star-Fiſh with nine Radii: See A.

Obſerving it again towards Evening, I found it had turned itſelf on one Side, whereby it gave me an Opportunity of diſcerning a very ſhort pellucid little Body grown from its Head-Part. The Arms were much ſtretched out and in continual Motion, which ſeemed owing in ſome meaſure to Multitudes of Lice tormenting it.

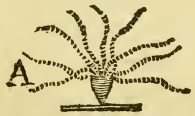
The Figure of it is ſhewn at B.

June, 15.---The *Polype* ſtood upright to day, ſtretching out and waving its Arms about in the Water, and ſeized a Worm with Greedineſs, which it ſoon killed and ſucked the Blood out of: but none of the ſubſtantial Part ſeemed to be ſwallowed by it. The Body was a little longer than yeſterday, but ſtill very ſhort and ſmall.

By the Aſſiſtance of a fine Hair Pencil I bruſhed off Abundance of the Lice which ſwarmed every where about it; and after waſhing it three Times in clean Water, it appear'd relieved and eaſy.

June, 16.----The Body was evidently grown longer and larger, but in the Form of a Cone. It ſeemed in full Health and Vigour, and appeared extending its Arms, as below at A.

June, 17.---Its Figure this Morning differed not from that of yeſterday, excepting that the Body was a little more extended. I gave it a ſmall Worm, which it now made a Shift to ſwallow Part of: the Remainder was left hanging out of its Mouth, as at B, and continued ſo ſome Hours.



I obſerved it frequently for ſeveral Days after this, and took notice of very little Alteration, beſides the Growth of its Body. It was fed every two Days, and ſometimes oftner: and appeared ſo like other *Polypes* that I ſeldom examined it with Glaſſes; but placing it before the Microſcope again, on the firſt of *July*, to my great Surprize I found it had then ten Arms, inſtead of nine which it had at firſt; and that three of the Arms iſſued out below the reſt, and made as it were the Beginning of another Row.

Row. I immediately took its Figure as it is here given.

This Creature being again extreamly louſy, I bruſhed it with my Hair-Pencil, and hoped by ſeveral Waſhings to have made it eaſy: but in the Operation, it ſlipped away, I knew not how, with the Water, and was unfortunately loſt.

EXPERIMENT XVIII.

Turning a POLYPE *Inſide out.*

JULY, 6, 1743. Having learned by one of Mr. TREMBLEY's Letters, which you, SIR, received after the preceeding Experiment, and was pleaſed to favour me with a Sight of, that his Method for preparing a *Polype* for turning Inſide out, is, by giving it a *Chryſalis* of the *Water-Tipula*; which, when ſwallowed, diſtends the *Polype*'s Stomach and Body, and having ſome Degree of Hardneſs, enables him, by gently preſſing it from the Tail upward towards the Mouth, and at the ſame time puſhing the Tail behind, to return it back again through the Mouth along with the Tail and Body, and thereby compleatly turn it. I was deſirous of doing the ſame Thing; but being unable to procure any

any ſuch *Chryſalis* at *London*, I fancy'd that perhaps I might perform this Operation by other Means, though ſomewhat in the ſame Manner.

I fixed my Eye, for this Purpoſe, on a very large *Polype* of the long-tailed Sort, with only ſix Arms, that had no young One iſſuing from it, and gave thereto one of the biggeſt Worms I could get; the whole whereof I was certain it could not poſſibly ſwallow. The *Polype* ſeized the Worm immediately, and in leſs than a Quarter of an Hour had gorged as much of it as its Body was able to contain, leaving one third Part at leaſt hanging from its Mouth.

Things ſucceeding thus far to my Wiſh, I looſen'd the *Polype*'s Tail from the Side of the Glaſs, took it out with a Scoop-Pen, and put it on a wetted Slip of Paper; for I judged it the beſt Way not to remove it before it had ſwallowed the Worm, leſt it ſhould refuſe to eat afterwards.

This done, I ſet myſelf to work with a great deal of Care and Gentleneſs; and fixing my Paper whereon the *Polype* lay, by a Pin, to the Writing-Deſk where I ſat, I took hold of the Worm, by means of a Pair of Nippers which I held in my Right-Hand; and at the ſame Inſtant thruſting againſt the *Polype*'s Tail with the Head of a very ſmall Pin, (the Point whereof I had previouſly faſtened into a Piece of Stick, which

which ſerved me for an Handle to guide it by,) I proceeded cautiouſly and leiſurely: and after ſeveral Tryals with the Worm and Pin, what by pulling one and puſhing with the other, the Stomach, wherein Part of the Worm lay folded, came along with it through the Mouth, and was followed by the Tail, Pin and all: ſo that the *Polype* was really and compleatly turned, tho' the Pin had made an Hole quite through it, contrary to my Intent, and would have injured it much more, or, perhaps, unturned it, had I pulled it back the ſame Way it entered in: but being aware of that, I unfixed the Pin from the Stick, took hold of it with my Nippers, (the *Polype* being ſpitted as it were upon it,) and pulled it away by the Head, leaving the *Polype* fairly inſide out.

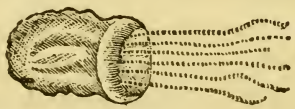
I put it then immediately into ſome Water, in a ſmall clear ſhallow Glaſs-Veſſel, made on Purpoſe for applying this Creature to the Microſcope; and examining it with ſeveral Glaſſes of different magnifying Powers, diſtinguiſhed, with the utmoſt Certainty, that what had been the internal Part of the Body was now really on the Outſide, as far as the Stomach reaches, but that the Tail-End was ſtill unturned, and remained within the Body.

The Arms now iſſued out from the End of the Head, inſtead of being ranged about the Sides thereof: and the Lips or Edges of the

the Mouth formed a Circle round the Arms, where turning very much outwards, they seemed endeavouring to fold themselves down the Sides of the Body, and bring it to rights again.

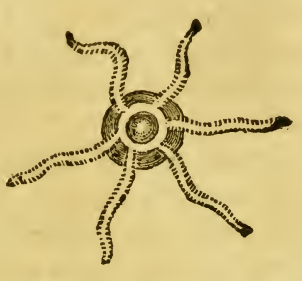
The present Outside appeared of a white Colour, flabby, uneven, and in many Places as if torn. The Body was short in Proportion to its Thickness, and the Tail-End roundish, but irregular: occasioned by the Tail's lying within the Body.

The Arms, in a little while, extended themselves pretty much, at which Time the Figure of it was as represented below.



I turned this *Polype* at eleven o'Clock in the Morning, and observing it again about five in the Afternoon, found it then on the Tail-End, waving about its Arms. The Head or Mouth-Part being placed upwards, and directly under my Eye, appeared by the Microscope as a large wide round Opening, like the Mouth of a *China* Jar: down which I could see so distinctly, as clearly to discern several of the Lice, which had been on the Outside when I turned it, now crawling about nimbly within the Body, whose Sides kept asunder, and formed a considerable Cavity,

Cavity, bellying out immediately below the Mouth. Dr. PARSONS, who was with me, made a very exact Drawing of its Appearance, from which the ſmall One below is copy'd.



By ſaying I found it on the Tail-End, I would not be underſtood to mean that it was fixed by the Tail, as *Polypes* uſually are; for it did not adhere at all. But the Tail-End being ſomewhat flattiſh, it had placed itſelf thereon, and ſeemed to chuſe that Poſition: for when I put it on one Side, it quickly turned itſelf upright again.

July, 7.---Looking on my *Polype* this Morning, I found it divided in two Pieces a little below the Circle of its Mouth and Arms. The Head-Part had turned itſelf right again, and appeared with its Arms like a Star, as in the Head of the firſt Experiment. The Body was ſtill inverted, but more colourleſs than yeſterday, ſlimy, and without any Signs of Life that I could be certain of.

I put

I put it by itſelf in a Glaſs of freſh Water, and looked at it frequently, but ſaw no Diſtenſion or Contraction: before Night it was almoſt all diſſolved, and next Morning Nothing could be ſeen but Slime.

The Head-Part ſeiz'd a Piece of Worm, and in about a Week produced a new Body with the Right-Side out, as in other *Polypes*.

Though I made ſeveral Trials before and ſince, I could never ſucceed in turning *Polypes*, ſo well as in the above Experiment: which I impute to my Want of the Means Mr. TREMBLEY uſes, as well as the Dexterity whereof he is Maſter: whoſe Account of his having turned many, and their living, thriving, and producing young Ones in that inverted State, I don't in the leaſt doubt the Truth of. And when that Gentleman pleaſes to publiſh his own Method, which I ſhould think myſelf unworthy of knowing if I endeavoured to take any of the Honour of it from him, moſt reaſonable People, I believe, will be convinced.

Notwithſtanding, this Operation will always be attended with great Difficulty: and none muſt expect to ſucceed in it, but thoſe who have much Patience, Care, and Dexterity; and have, moreover, been exerciſed in the niceſt manual Experiments.

EXPE-

EXPERIMENT XIX.

An Attempt to make the divided Parts of different POLYPES *unite.*

AUGUST, 4, 1743. Mr. TREMBLEY having informed us, that he ſometimes had found Means to make the divided Parts of different *Polypes* grow together, ſo as to form a Creature by the Conjunction of the Head-Part of one Animal with the Tail-Part of another, I was deſirous of trying the ſame Experiment: and chuſing for that Intention two *Polypes* of an equal Bigneſs, as nearly as I could judge, that they might the better tally together; I placed them in a Drop of Water, on a Slip of Paper, ſide by ſide, with their Heads turn'd the ſame Way; that, as ſoon as cut aſunder, the Head-End of either might eaſily be brought to the Tail-End of the other.

Being diſpoſed after this Manner, I waited till they both were extended at the ſame Time, and then watching my Opportunity, I divided them both, at one Stroke of the Sciſſars, Paper and all, exactly through the Middle of their Bodies.

My Paper was pretty broad, that one Part of it might not fall from the other upon cutting: and by making an Hollow in it, I contrived that the two *Polypes* might lye

lye in a Drop of Water, large enough for them to swim and extend in, without adhering to the Paper.

The four Pieces, after Cutting, lay in this Drop as I intended, and stuck so little to the Edges of the Paper cut therewith, that I instantly disengag'd them; and then, as fast as possibly I could, brought the Head-Parts of one to the Tail-Parts of the other, at the Ends where they had been separated. But, although I was not long in doing this, the wounded Ends had begun to contract and round themselves, before I could possibly make them meet: and after many Trials I found they would not adhere.

Mr. TREMBLEY mentions this as an Experiment attended with much Difficulty, and what frequently fails to succeed; nor does he say any thing of the Way he performs it; and therefore I have given my Manner of attempting it, and my Disappointment therein; hoping somebody else may contrive to bring the Parts more suddenly together; for on that, I apprehend, the whole Success of the Experiment depends; since, it is highly probable, if they could be brought in contact almost instantaneously after Cutting, they would readily unite.

The four Pieces were kept in Water, and in a few Days, they all became handsome and perfect *Polypes*.

This

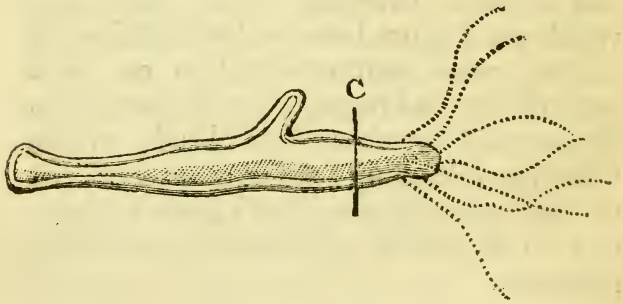
This Experiment I repeated ſeveral Times over, as alſo that of making the divided Parts of the ſame *Polype* grow together again, but had never the good Luck to ſucceed in either.

The following Experiments, with ſome Obſervations immediately ſucceeding them, and accurate Drawings thereto belonging, which the Figures here can but indifferently imitate, were communicated to me by a moſt diligent and unprejudiced Enquirer into Nature and Searcher after Truth, whoſe valueable Friendſhip I am extremely obliged to, and whoſe Name (had I leave to mention it) would be an Honour to my Performance.

EXPERIMENT XX.

A speedy Reproduction of a new Head.

" THE fourth of *August*, 1743, at
" twenty Minutes after eleven o'Clock,
" I cut a *Polype* which had seven Arms and
" a young One rising from it, but without
" Arms, as represented in the under Figure,
" where the Line (c) shews the Place of
" Cutting.



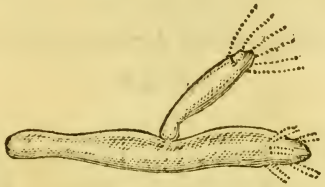
" The Head-Part extended its Arms im-
" mediately, but would not eat a Worm
" put to it.

" *August*, 5.---This Morning, at eleven
" o'Clock, the young One remaining upon
" the Tail-Part had six Arms. The Part
" cut appeared rounded.

" *August*, 6.---At twelve o'Clock, the
" Tail-Part was not only healed and sharp,

" but

" but had apparently five Arms, tho' very
" ſhort, as repreſented below.



" I gave it a Worm, which it catched
" hold of, though the Arms did not then
" appear more extended than they are ſhewn
" in the Drawing.

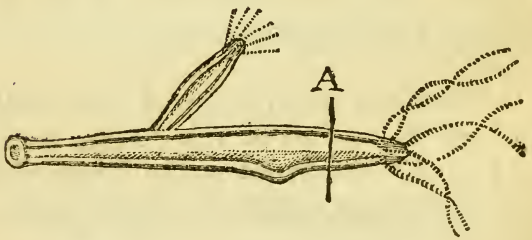
" *Auguſt*, 10.--At one o' Clock the young
" One came away, and had eight Arms:
" the Part from which it came had nine
" Arms, altho' the Head-Part of the ſame
" *Polype* had only ſeven Arms.

" I have not taken notice of the healing
" of the Head-Part of this *Polype*, becauſe
" I find no Difference in the Time which
" all theſe Parts require to become perfect.

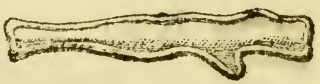
EXPERIMENT XXI.

A young POLYPE *becoming its Parent's Head.*

" *AUGUST*, 15, 1743. At 4 o'Clock, I cut a *Polype* which had twelve " Arms (although six of them are only re- " presented in the Drawing) and a young " One dependent with seven Arms; oppo- " site to which, but nearer the Head, was " a small Protuberance, as represented un- " derneath, where the Line A. shews the " Incision.



" *August*, 17.---The Head-Part was heal- " ed: the young *Polype* upon the Tail- " Part came away: the first Protuberance " was increased, and another appeared on " the contrary Side, as the Figure shews.

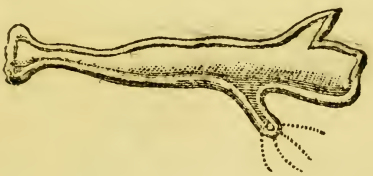


" *Au-*

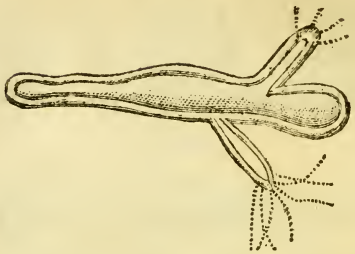
" *Auguſt*, 18.---At ſix in the Afternoon, " the firſt Protuberance appeared with a " ſharp Point, like an Arm, growing from " the Middle of the Head, as below.

" The oppoſite Excreſcence was increaſ- " ed.

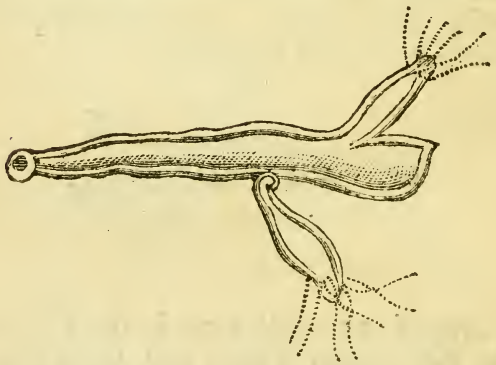
" *Auguſt*, 19.---At forty Minutes after " eight in the Evening, the young *Polype* " had four Arms very diſtinct, and the op- " poſite Excreſcence appeared ſharp and " pointed as in the Drawing.



" *Auguſt*, 20.---At ſeven in the Evening, " the firſt young *Polype* had ſeven Arms, " and that oppoſite was thicker than young " *Polypes* generally are, and had four ſhort " Arms, as the Figure in the following " Page ſhews.

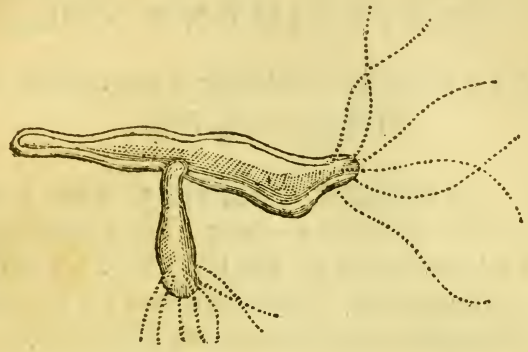


" *August*, 21.---In the Afternoon, at four,
" the young *Polype* with seven Arms was
" grown larger, and that opposite there to ap-
" peared nearer the Part where the Cut was
" made. The Gut passed beyond the *Po-*
" *lype*, but with a Communication as below.

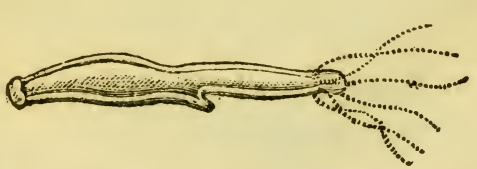


" *August*, 22.---At a Quarter after eleven,
" the young *Polype* with seven Arms was
" grown longer: the opposite *Polype* was
" apparently sunk from its former Appear-
" ance, and was now the Head of the Tail-
" Part of its Parent. There were no Re-
" mains of the Projection beyond it, but a
" Thick-

" Thickneſs making ſomething of an Angle
" under it, as repreſented in the Figure.



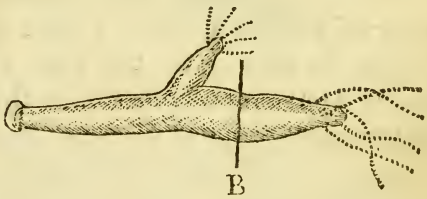
" In this Shape it continued till the twen-
" ty ſeventh, at twelve, when a ſmall Pro-
" tuberance appeared oppoſite to the young
" *Polype* with ſeven Arms, which young
" *Polype* came away on the twenty-ninth.
" *Auguſt*, 31.---At twelve, the Angle be-
" low the young *Polype*, that was become a
" Head to its Parent, appeared no more;
" but the ſaid Head lay now in a direct
" Line with the Body, and ſeemed as en-
" tirely of a Piece with it, as the Heads of
" *Polypes* do that have not been cut. Its
" whole Appearance is ſhewn in the Figure
" underneath.



EXPERIMENT XXII.

A cut POLYPE *producing a young One, but not repairing itself.*

" *AUGUST*, 22, 1743. After I had
" observed a young *Polype* become it-
" self an Head to the headless Part which
" produced it, I was desirous to try whe-
" ther this Appearance was so extraordinary
" as it seemed to me, not having been
" mentioned in any of the Accounts of
" these Creatures I have seen; and there-
" fore, at twelve Minutes after eleven, I
" cut a *Polype* with five Arms, which had
" also a young One with five Arms depen-
" dent on it, as represented in the Figure
" underneath, where the Line B shews the
" Place where it was cut.



" *August*, 24.---I found it much the same
" as when cut.

" *August*,

" *Auguſt*, 25.--- At eleven, it appeared " rounded at the End where cut, as be- " low.

" *Auguſt*, 27.--- At half an hour paſt " eleven, the young One came away, and " the cut Part from being round appeared " as in the Figure.

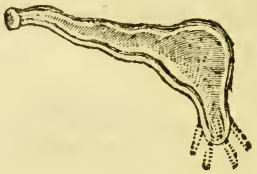
" *Auguſt*, 28.---At twenty minutes after " ſeven in the Evening, a conſiderable Pro- " tuberance appeared on one Side, oppoſite " to that whence the young One had come, " in the Manner of the next Figure.

" *Auguſt*, 29.--- At ten in the Morning, " the Protuberance was longer and ſharp in " the Middle, as the Figure ſhews.

" At

" At eight the same Evening two Arms " were visible, the Head rounded, and " the rest of the Body as below.

" *August*, 30.---At two o'Clock, it ap- " peared as in the Figure following,

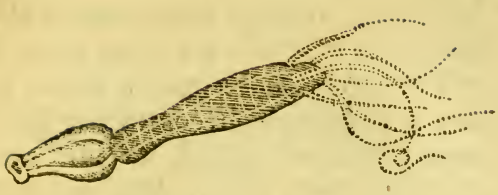


" *August*, 31.---At one, the Appearance " of the *Polype* was chang'd in the Man- " ner represented below.

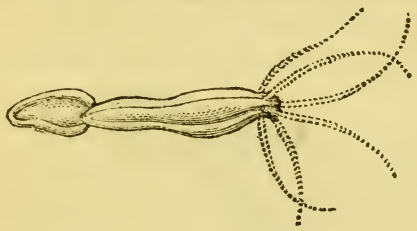
" It continued thus without any remark- " able Alteration, till

" *Sept.* 6.---At twelve, when upon Ex- " amination I found the young One plainly " distinct from the Parent, and dependent " upon the Place where the Parent was cut " and the Head usually grows after the " Operation. The Representation adjoined " will explain my Meaning.

" *Sept.*



" *Sept.* 7.---At thirty minutes paſt eleven
" the young One ſeemed dependent only by
" the Point of its Tail, and appeared as be-
" low.



" I apprehend in a few Days it will come
" away.

" What is ſtrange in this Appearance is,
" that the Part of a *Polype* cut off the
" twenty-ſecond of *Auguſt* ſhould continue
" producing Young to this Day, without
" having gained to itſelf Head or Arms, or
" becoming in any Degree more perfect than
" it was when cut.

The ſame curious Gentleman goes on thus in his Obſervations.

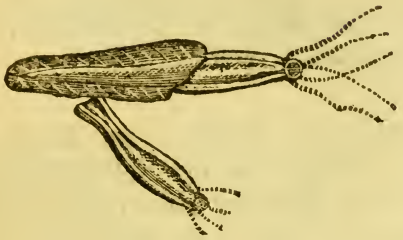
" I ſhall now give you an Account of two
" ſeemingly ſtrange, or at leaſt uncommon

" Appearances in *Polypes* which have not " been cut; one of them not at all, the " other only Part of two Arms taken off.

" The firſt, whoſe Figure is ſhewn below, " was a *Polype* which contracted itſelf the " twenty-fifth of *Auguſt*, ſo that none of " its Arms were diſcernable, and became " of a dark brown Colour. This I attri- " buted to ſomething in the Rain-Water; " and, upon Examination, found the Wa- " ter had come from a Place where ſome " Lime had been left.

" I immediately changed the Water, and " the *Polype* the next Day extended itſelf a " little, but ſtill the Arms were inviſible. " In this Condition it remained, although " the Water was daily changed, till the ſe- " cond of *September*, at eleven o'Clock, " when I diſcover'd the Head and Arms " extended by my naked Eye; and exami- " ning it with the Microſcope it appeared " invelop'd in a thick Cloud, or Skin, of

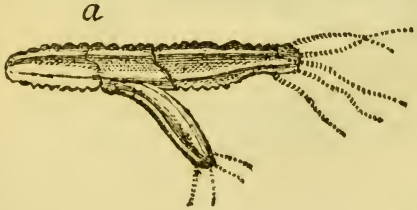
" a blewiſh white Colour, in the Form " repreſented underneath.



" The Head and Tail appearing at each " End, and the young One adhering to this " Part, made me conclude it was really the " Skin of the Parent.

" *Sept.* 3.---At two o'Clock, the Head " and good Part of the Body appeared clear " of this Skin, which was ſhrunk lower " than the Day before, but the Tail was " covered with it: only the Gut of the " *Polype* was viſible through it. In this " Condition it continued, the outer Skin " only growing whiter to the ſeventh of " *September*, at eleven, when it appeared " as repreſented in the Figure below.

a



" The

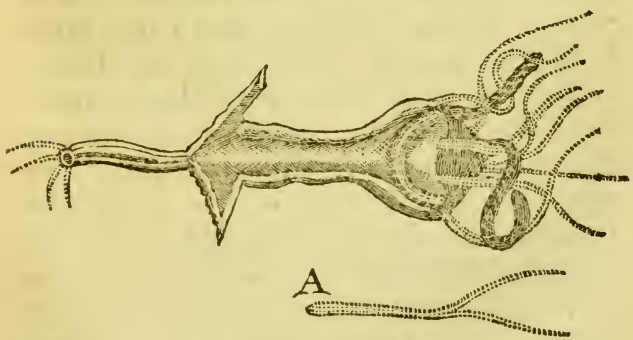
" The outer Skin was greatly lessen'd, " but there appear'd a Break quite across " the Gut of the *Polype*, easily discerned " through the Skin, a little below the de- " pendent young One at (a).

" I make no doubt, you know that " when a *Polype* dies it dissolves in the Wa- " ter: now, whether this outer Skin has " done so, or that at the Beginning it was " a Swelling which abated by the Change of " the Water, I shall not determine: altho' " its first seeming to draw downwards to- " wards the Tail, and decreasing upwards " towards the Head, would induce one to " suspect something of the Insect's casting " the Skin hurt by the Lime-Water.

" The other Particular I proposed to men- " tion, is this; a *Polype* which had two of " its Arms cut off, but without touching " the Head, appeared upon Examination, " the thirty-first of *August*, of so odd a " Shape, with a young One growing exact- " ly at its Tail, and a little Protuberance on " each Side, that I thought proper to give " its Figure, as follows.

" The

"The Arms which had been cut the
" twenty-ſeventh of *Auguſt* were not diſtin-
" guiſhable from the reſt, all being con-
" tracted as in the above Figure: but the
" firſt of *September* I found it playing its
" Arms at full Length, and then One of
" them appeared double or forked, but all
" the others as uſual. In order to know
" whether it was a Miſtake, or if the In-
" ſect would uſe the double Arm, I gave it
" a Worm, which it catched greedily, and
" uſed the forked Arm like the reſt. The
" Arm is ſhewn underneath at A, and the
" *Polype* itſelf above it eating a Worm.



" Here

" Here the young One at its Tail appears " with four Arms, and very long; the two " at the Sides ſeem ſharp.

" *Sept.* 2.---The young One came away " perfect from the Tail, and the other two " continued very thriving.

" I am now going to take notice of ſome " Circumſtances in relation to the Faculty " theſe Creatures have of removing from " one Place to another, or after their Food " or Prey, which they do not ſeem to per- " ceive till it has touched them, and then " they generally catch hold of it, by ex- " tending their Arms or Bodies, the Tail " remaining fixed to ſome Part of the Glaſs: " and when they change Place, I have " commonly obſerved that they do it by " laying their Tails over their Heads, or their " Heads over their Tails, for they do both: " the Inſect appearing in a Ring at that " Time.---But the twenty-ſeventh of *Au-* " *guſt*, at one o'Clock, after I had put a " Worm into the Glaſs with the Head- " Part of a cut *Polype* which had recover- " ed the Operation, whilſt I was obſerving " it play with the Worm, and that had, by " a ſudden Jerk, caſt itſelf a little Way " from the *Polype*, I thought I ſaw the " *Polype* ſhoot after it: and it did catch the " Worm again. I then took a Magnifier, " (the *Focus* I think about three Inches)

" and

" and ſearching for ſomething in the Glaſs " to meaſure from, that I might be more " certain of the Truth, I found a little Speck " in the Bottom of the Glaſs, even with that " Part below the Head of the *Polype* from " which the Arms riſe. Keeping my Eye " fixt to the Speck and *Polype*, I plainly " ſaw it thruſt itſelf forwards with a ſeem- " ing Spring; ſo that the Speck in the Glaſs " was now even with the upper Part of " the Tail: and, in a Second after that, the " *Polype* thruſt itſelf forwards in the ſame " Manner, and left theSpeck in the Glaſs " about the twelfth Part of an Inch behind " it.

" During all theſe Motions I could not " perceive either the Arms or Body more " extended than when I firſt put in the " Worm, altho' I attended particularly to " that Circumſtance.

" I don't know whether you have found " any of the Arms cut off, without any " Part of the Head or Body adhering, to " be endued with the reſtoring Quality " which the Body has: but I have tryed the " Experiment four Times; and altho' the " Arms cut off continue with Life, con- " tracting and extending themſelves, and " waving about; yet the ſecond Day they " have always diſſolved, and appeared like

" tranſparent Duſt, all the *Papillæ* being " ſcattered *.

Since the preceeding Sheets have been printed off, my worthy Friend Mr. MILES has ſent me ſome *Polypes*, taken by him at *Tooting*; with an exact Deſcription of the Place where they were found; which I ſhall beg leave to inſert, as it may prove of ſingular Service to direct People in what Sort of Places to ſearch for them with a Probability of Succeſs, and alſo as it is a Confirmation of what was ſaid before on this Subject (Page 62.) from the Information of ſome other Friends.

In a Letter, dated *September* 17, 1743, he writes thus.---" I have now the Satisfaction " to tell you, that I yeſterday met with a " large Number of *Polypes* about a Quarter " of a Mile from us, in a Place I had ne- " ver examined till then.

" It is a Ditch, ſupplied from a Spring in " the Neighbourhood, that is never known " ſenſibly to increaſe or decreaſe; the Wa- " ter about a Foot deep, and the Bottom " lined with a light ouzy Mud, conſiſting " of the decayed Leaves of Plants and other

* I have tryed the ſame Experiment ſeveral Times with exactly the like Succeſs.

" Materials,

" Materials, but little of it pure Mud. The " Sun ſhining thereon, and the Water be- " ing very tranſparent, the Bottom made " an Appearance beautiful enough, ſome- " what like very fine Moſs, mixed with a " Number of Water-Snail-Shells, Peri- " winkles, *&c.*

" Having tryed the thicker heavier Mud " oftentimes without Succeſs, I was invi- " ted the rather to try this, and according- " ly brought Home a little of the Water " with ſome of the Plants growing in it, " the Principal of which being, if I miſ- " take not, one of the Species of the *Equi-* " *ſetum paluſtre**.

" After it had ſtood an Hour or two in " my large Glaſs-Jar, I obſerved ſeveral " *Polypes*, in all reſpects like thoſe I receiv- " ed of you: excepting that they are many " Times ſmaller when viewed with a *Lens* " of an Inch *Focus*, than thoſe we have in " our Nurſery are when beheld with the " naked Eye. Indeed I never ſaw any " Branchers ſo ſmall as theſe; and yet they " ſeem to be in Health.

" When I firſt met with them, I ſpent " ſome Time in obſerving them, to ſee what " Food they eat: but I could not find they " eat any thing beſides ſmall Worms, ſo

* Several Pieces of this Plant were ſent over among the *Polypes* that came from Mr. TREMBLEY.

" ſmall as not to equal one of their Arms in
" Thickneſs; which, if I can judge by
" their Motion, (for I could not examine
" their Form with a deep Magnifier) are
" the Worms which produce Gnats, juſt
" come out of the Egg; beſides which I
" ſee nothing proper for their Food in this
" Water, (I mean for Bulk) except the
" Animalcules which infeſt them: and per-
" haps they are Vermin to them.

" I am attempting to nurſe ſome of them
" up, to ſee whether they will not increaſe
" in Size; and ſhould be glad to know
" whether they are ever found ſo large in
" Ditches as ours are that are kept in the
" Houſe.

This Gentleman has ſince informed me, that the Water at the Spring Head is thought ſomewhat hard, but is exceedingly fine and well taſted, and, where he found the *Polypes*, glides along very leiſurely: that he had ſought for them within an hundred Yards of the Place, in vain, but that the Mud or Soil at the Bottom where he formerly tryed was altogether different, being very thick, heavy and black: that he has been told the Ditch where he met with them was cleaned (as they term it) twice this Summer, which may account for the Lightneſs of the Soil at Bottom: and that there is not a Leaf of the *Lens paluſtris* to be ſeen in it, which he

aſcribes

aſcribes to the ſame Cauſe, ſince all the neighbouring Ditches are covered with it.

Theſe *Polypes* at firſt were full as ſmall as the green Ones deſcribed Page 20. They were alſo very white or pale, through Emptineſs; but eat Pieces of Worms greedily; and after being fed appeared of a red Colour, from the Blood of the Worm ſeen through their Skin. Moſt of them that I have are furniſhed with ſeven Arms, and are generally extended ready to ſeize their Prey.

They are now thriven to ſuch a Degree, by good Feeding, as to be doubly the Size they were when taken, but ſeem at their utmoſt Growth.

CHAP. XI.

A Microſcopical Diſcovery.

HAVING lately had the Pleaſure of ſhewing, SIR, to You and ſeveral other curious Gentlemen a Diſcovery made by the Microſcope, which both You and They have judged worthy Notice; I hope it will not be thought improper to add it to theſe Experiments.

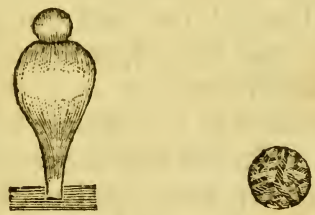
Keeping a ſmall Quantity of the black Mud of the *Thames* with ſome Worms therein to feed my *Polypes*, in an earthen Veſſel that contains about half a Pint; I poured every Day a little Water thereon, to ſupply the Worms with freſh Nouriſhment and prevent their becoming putrid. This Water, however, I conſtantly drained off in a few Minutes, leaving none of it in the Veſſel but what the Mud ſoaked in; ſo that it appeared always moiſt, but never wet.

In ſome Mud that had been thus treated for about a Fortnight, I obſerved in many Places, and particularly about its Edges, on the ſixteenth of laſt *September*, a great many glittering or ſhining minute Bodies, in Appearance and Size not much unlike ſome of the clear tranſparent Grains of large Sea-Sand, which indeed at firſt I imagined them

to

to be: but examining them with more Attention, I could perceive with my naked Eye, that they were little tranſparent oval Bodies, about the twentieth of an Inch in Height, having a ſmall black Crown or Button at the Top of each. They ſtood upright in the Mud pretty cloſe together, and made a very pretty Appearance.

Pleaſed with this Sight, I immediately placed one of them before the Microſcope, and found the Shape thereof exactly reſembling a *Florence* Flaſk with the Bottom upwards, and thereon a round Button or Crown ſomewhat depreſſed upon the Top, as in the Figure.



The Body and Neck of the Flaſk, if I may term them ſo, appeared as if full of the cleareſt Water, and were ſo perfectly tranſparent, that when their *Focus* was adjuſted to the *Focus* of the Magnifier, the Windows of ſome oppoſite Houſes could plainly be diſtinguiſhed through them; and, as you was pleaſed to obſerve, were repreſented inverted in the ſame Manner they would have

been if ſeen through a Piece of Glaſs of the like Form.

The Crown, Cap, or Button at Top was black on the upper Part, with certain irregular little Ramifications thereon of ſomewhat a whitiſh Caſt: (See Fig. II.) but down its Sides to where it joyns the Flaſk it was of a yellowiſh tawny Colour; and the Flaſk itſelf had a little yellowiſh Tinge when viewed in a Side-Light.

While I was examining this curious Object, the Sides of it began to ſhrivel, collapſe together, and grow opake, by the drying of the little Lump of Mud whereon is ſtood: but upon applying a Drop of Water thereto, in a Minute's Time it became again plumped out and tranſparent under my Eye, and ſeemed, as before, like a Glaſs filled with Water.

This ſeems to be a minute Plant, not yet, I think, deſcribed: of a very extraordinary Form and Growth. Its Root is in the Mud, whence it riſes on a Stalk or Stem like the Neck of a Flaſk; and, probably, the black globular Body on the Top is its Fruit or Seed.

They continued a few Days, but cold Weather coming on, they diſappear'd all together.

The

The CONCLUSION.

HAVING now, SIR, laid before you the moſt remarkable of my Experiments, in relation to the cutting *Polypes* aſunder, and the Re-production of new Parts to make each Piece a perfect *Polype*; I ſhall entreat your Patience a little longer, whilſt I add a few occaſional Reflections..

When Accounts of the extraordinary Properties of this Creature were communicated to you from the *Hague* by the Honourable Mr. BENTINCK, from *Verſailles* by Mr. BUFFON, and from *Paris* by Mr. REAUMUR, as well as by Mr. TREMBLEY himſelf, all atteſting the Truth thereof upon their own repeated Experience; they were received with a due Regard to the Character and Reputation of the ſaid Gentlemen, who are known full well to be Perſons of too good Underſtanding to be themſelves impoſed on, and too much Honour and Veracity to attempt to impoſe on Others: tho' it was never expected we ſhould reſt contented with their Accounts without making Experiments ourſelves: *Nullius in Verba* being the wiſe Motto and eſtabliſh'd Maxim of the ROYAL SOCIETY. But in reſpect to the Repntation of the ROYAL SOCIETY,

as

as well as to the Gentlemen who communicated theſe Diſcoveries, it became incumbent on us, as ſoon as they had ſent the Inſects over hither, to put them to a ſevere but ſpeedy Trial, and from the Iſſue of our own Experience, either convince the World that theſe Gentlemen had been miſtaken, or give our Teſtimony that what they affirm is true. This, SIR, was your Opinion: ſuch a Trial you put them to without Delay; and by three or four Experiments, which you was pleaſed to publiſh, the Doubts of moſt that have read them, are, I believe, removed; but as in Caſes of an extraordinary Nature, the Experiments and Atteſtations of different People ſerve more effectually to eſtabliſh Truth, I have thought proper, (by thoſe I have juſt now laid before you,) to give my Evidence alſo; ſince it may contribute ſomething towards encouraging Foreigners to communicate any curious Diſcoveries they may happen to make hereafter, when they find we receive them in a civil Manner, and take ſome Pains to do them Juſtice. And, indeed, this Publication is in ſome Manner become my Duty, as ſeveral other Gentlemen, after ſatisfying themſelves by cutting theſe Creatures aſunder and obſerving their Reproduction, have been pleaſed to ſuppreſs their own Experiments in Compliment to mine.

Though

Though real Facts are inconteſtable Arguments, and no Reaſoning ſeems neceſſary after ſo many repeated Experiments, there are certain Prepoſſeſſions, Prejudices and Humours among Mankind (ariſing from early imbibed Theories or Syſtems, according to which they have accuſtomed themſelves to judge of Things) that make People ſometimes diſbelieve even what they ſee, are ſtronger than Reaſon, and will hardly be conquer'd even by the plaineſt Facts.

Hence it is that ſome have objected to the Reality of the *Polype*'s being a living Creature, notwithſtanding its moving from Place to Place, ſeizing its Prey, eating, digeſting, and other Animal Functions: becauſe its other Properties happen to be unſuitable to their Hypotheſis of Life in general.

If the Animal Soul or Life, ſay they, be one indiviſible Eſſence, all in all, and all in every Part, how comes it, in this Creature, to endure being divided forty or fifty Times, and ſtill continue to exiſt and flouriſh?

Again: If animal Identity, ſay they, conſiſts in Conſciouſneſs; and if every living Creature is ſenſible of Pleaſure and Pain, or in other Words has a Conſciouſneſs, which moſt think a reaſonable Suppoſition; when the *Polype* is divided into ſeveral Parts, all ſoon becoming perfect *Polypes*, where ſhall we

we find the Identity of the original *Polype?*

These Queries, I must acknowledge, I am wholly uncapable of resolving: but let those who tye themselves down to such Theories seriously consider, whether they believe themselves so perfectly acquainted with every living Creature God has made, and with all the Modes and Circumstances of the Life of each, as to be certain their Theories comprehend them all. 'Tis, methinks, a little presuming to restrain the Operations of Nature, or imagine that God has done nothing but according to certain Rules well known to us.

There are other People still, who, altho' convinced of Facts, remain dissatisfied unless all the Steps whereby those Facts are brought about can be mechanically described, and a Reason assigned for them. Hence it comes to pass, that some who have been Eye-witnesses of the Cutting and Reproduction of these Creatures, and have no Doubt at all remaining as to the Reality of what has been related concerning them, are yet frequently enquiring how their wonderful Faculties can be accounted for, and wherefore they are bestowed on this Animal. To which I answer :--- no otherwise, in my Opinion, than by resolving them into the Will and Pleasure of their almighty Crea-

Creator; which I likewiſe believe the moſt reaſonable Way of accounting for the Qualities or Properties of moſt other Things around us. To which give me leave to add, that if we would employ more of our Time and Pains to diſcover what the Forms and Qualities of Things really are, and amuſe ourſelves leſs with accounting for them and finding out why they are, (which is aiming beyond our Reach) we ſhould probably be wiſer, and perhaps better.

Our Senſes, with all the Aſſiſtances we can give them, are capable of informing us but to a certain Degree: our Underſtanding is likewiſe limited in its Judgment according to the Information of our Senſes; whereby it is evident, that our Senſes and Underſtanding are adapted to each other, and that our Underſtanding is properly and uſefully employed when we examine by it the different Forms and Circumſtances of Things Animate or Inanimate which our Senſes preſent before us. But it is a kind of Madneſs, or at beſt miſ-ſpending Time, to hunt after the hidden and inviſible Cauſes or *Modus operandi* of ſuch Forms or Qualities, which we can never poſſibly find out.

It is one great Part of Wiſdom to know what we have Abilities for, and what Things are beyond our Power; that we may apply to the former, and avoid perplexing ourſelves

ſelves about the latter. How much valueable Time has been thrown away in framing whimſical, unſatisfactory Schemes to account for the Operations of Nature, which might have furniſhed a great deal of profitable Knowledge, if ſpent in real Experiments on thoſe ſelf-ſame natural Operations?

The great Mr. BOYLE, in his *Eſſays*, expreſſes himſelf finely to this Purpoſe. "When "a Writer, ſays he, acquaints me only with "his Thoughts or Conjectures, without en- "riching his Diſcourſe with any real Ex- "periment or Obſervation, if he be miſta- "ken in his Ratiocination, I am in ſome "Danger of erring with him, or at leaſt "am like to loſe my Time, without re- "ceiving any valueable Compenſation for "ſo great a Loſs; but if a Writer endea- "vours, by delivering new and real Obſer- "vations and Experiments, to credit his "Opinions, the Caſe is much otherwiſe: "for let his Opinions be ever ſo falſe (his "Experiments being true) I am not obli- "ged to believe the former, and am left "at Liberty to benefit myſelf by the latter; "and though he have erroneouſly ſuper- "ſtructed upon his Experiments, yet, the "Foundation being ſolid, a more wary "Builder may be much farthered by it, in "the Erection of a more judicious and con- "ſiſtent Fabrick."

Curioſity

Curioſity and a Fondneſs of Novelty are implanted by Providence in the Mind of Man, to make him obſerve and examine Things attentively, diſtinguiſh their various Production, Form and Structure, and admire their Beauties, Properties and Uſe. Whilſt he is doing this, he is improving his Judgment, performing his Duty, and making himſelf happy. But this ſhould be done with Modeſty, laying aſide all Prejudice and Obſtinacy, cautious of giving Way to the Deluſions of Imagination, or being tyed down to any Opinions, whatever great Name are ſubſcribed to them; ſince nothing, perhaps, hinders the Improvement of Knowledge ſo much as the Belief that we know Things ſufficiently already.

Natural Hiſtory is very deficient as to the larger Animals, and more ſo in regard to Inſects: but when we come to the minute Creation, 'tis almoſt a *Terra incognita:* therefore here every Thing muſt appear wonderful and extraordinary, as the *Polype* does at preſent; not that conſidered in itſelf it is more ſo than thouſands of other Things, whoſe Frequency makes them diſregarded by us, though poſſeſs'd of Qualities no leſs deſerving our Admiration, or eaſier to be accounted for.

To mention one ſingle Inſtance.---How wonderful are the Properties of the Loadſtone!

ſtone! How ſurprizing its Power of communicating them to Iron!---A Piece of this Metal, only by being rubbed on it in a particular Direction, becomes in a few Moments attractive of every other Particle of Iron or Loadſtone it comes near; and, if brought in contact, ſtrongly adheres thereto: though it ſtill retains a total Indifference for Gold, Silver, Lead, Copper, and every Thing beſides. At the ſame Inſtant, it acquires, likewiſe, a Polarity, whereby the two contrary Points thereof (if it be ſo ſuſpended as to turn at Liberty in the Air) will conſtantly direct themſelves to the different Poles of Heaven, and if diſplaced return to them again, and reſt no where elſe at Quiet: this too with a certain amazing Inclination, Declination, and Variation, altering in Degree according to the Parts of the World it is carried to. And theſe Properties, though thus ſuddenly acquired, remain with it not for a few Days and Weeks only, but for Years and Ages.

Were ſuch Things related to us of ſome certain Stone, in a foreign Country, which we could not procure a Sight of, 'tis likely we ſhould ſuſpect the Relator was impoſing on our Underſtanding: and thoſe that live under the Line probably think the ſame of the northern People, when they tell them, that, in their Country, Rivers and Seas are ſometimes

times made ſo hard, in the Compaſs of a few Days, that Armies may walk dry-ſhod over them.

But daily Experience ſhews us theſe Effects of the Loadſtone: they are plain and obvious to our Senſes, and conſequently proper Subjects for the Exerciſe of our Reaſon: which by conſidering them will find Means of employing them to many uſeful Purpoſes, and muſt neceſſarily lead us to revere the unſearchable Wiſdom of that almighty Being who has endowed them with ſuch amazing Properties.---In our Examination thus far we ſtand juſtified both to Reaſon and Religion: but when we attempt beyond this, and pretend to diſcover and deſcribe the Machinery whereby, and the Manner how theſe wonderful Effects are performed, which we neither have Senſes to diſcern, nor Abilities to judge of, all is Darkneſs and Uncertainty, we plunge into an unfathomable Abyſs without either Star or Compaſs to direct our Courſe, and are in the utmoſt Danger of Shipwrecking our Underſtanding.

Which of the many Hypotheſes, contrived to account for theſe Changes, can furniſh any reaſonable Satisfaction? or deſerves to be regarded otherwiſe than as a pretty In-

vention, a Cobweb of the Brain?---What do we really underſtand when we are told, "That "the magnetical Effluvia do not proceed "intrinſecally from the Stone, but are cer- "tain extrinſecal Particles, which approach- "ing to the Stone and finding congruous "Pores and Inlets therein, are channel'd "through it, and having acquired a Motion "thereby, do continue their Current ſo far, "till being repulſed by the ambient Air, "they recoil again and return in a vortical "Motion, and ſo continue their Revolution "for ever through the Pores of the Mag- "net?"—Such Examples will, I hope, be my Excuſe for not attempting to ſolve any of the Phænomena of the *Polype*, for which I have neither ſufficient Ingenuity nor Inclination.

I much queſtion if we are not alſo greatly miſtaken when we undertake to form a Judgment of the Senſations, Perceptions, Ideas and Underſtanding of other Creatures; ſince we have no Means of doing it but by the Standard of our own: which is, perhaps, as unfit for the Purpoſe as a Pair of Scales would be to meaſure the Height and Dimenſions of a Building.

The Percuſſion of Light or Air, or the Contact of other material Bodies on Nerves diſ-

diſpoſed in different Parts about us, and indued with different Degrees of Senſibility, occaſion all our Senſations and Perceptions. But the Senſations of the Nerves of the Eye are in ourſelves ſo different from thoſe of the Nerves of the Ear, that if either of theſe Organs be wanting, the Ideas commonly taken in thereby cannot be ſupplied or made intelligible.

Therefore, as we are taught by Experience, that 'tis hardly poſſible to give a blind Man any juſt Ideas of a ſeeing Man's Senſe of Colours, or a deaf Man of a hearing Man's Perception of Sounds, though they are Creatures of the ſame common Nature and in every thing elſe alike, would it be more ſtrange if we ſhould be as little capable of underſtanding or judging of the Senſations and Perceptions of Animals in many Reſpects different from Mankind?

May there not be more Modes of Feeling than thoſe five we call the Senſes, which are beſtowed on us for our Information of what paſſes near us, and by pleaſing or diſagreeable Senſations warn us of what is profitable or prejudicial to us, and conſequently what to chuſe, and what avoid? May not other Creatures, whoſe Structure, Organs and Way of living bear no Reſemblance to ours, (as Body may act on Body in various Manners) have Senſations alſo different from

ours, not only in Degree but Kind, for their particular Security and Happineſs?

This Suppoſition would account in ſome Sort for the Sagacity we may obſerve in every Species, (which can perhaps be ſolved no better Way) and give a clear Meaning to the Word Inſtinct, which is very confuſed at preſent: for it would then imply certain Impreſſions made on the Organs of Animals by Things about them, for their Information of what is hurtful or beneficial to them. Should this be the Caſe, every Kind of Animal muſt have Senſations diſtinct and different from thoſe of every other Kind, and what cannot poſſibly be known or underſtood by them: which Difference muſt be alſo as various as their Organs are. And if ſo, when we undertake to judge of the Actions, Abilities and Underſtanding of other Creatures, we are imitating the blind Man, who ſuppoſed that a Scarlet Colour is like the Sound of a Trumpet: and there may be more Truth than is commonly imagined in the Saying of MONTAIGNE, when he was playing with his Cat, that it was not impoſſible ſhe might think him as great a Fool as he thought her.

If we ſeriouſly examine ourſelves, we ſhall be ſenſible how little we underſtand, even of thoſe Things we may be ſuppoſed to know

know the beſt. Our Capacities are certainly beſt adapted to the Examination of our own Bodies, and what more immediately relates to their Production, Safety and Uſe: yet after the Enquiries of Ages, what Diſcoveries are made continually, and how much ſtill remains unknown? Can we tell certainly the Offices of all the Parts of our own Bodies, and how each performs its Duty? Do we know in what Manner, or by what Kind of Chemiſtry, all the Variety of Food, animal and vegetable, of different Taſtes, Qualities and Colours, are converted into the ſame common red Fluid call'd Blood? What know we yet of the digeſtive Power of the Stomach, which in a few Hours will ſoften hard Subſtances, and even diſſolve Bones?

If we conſider the Generation of ourſelves, which we may be ſuppoſed to underſtand better than that of other Creatures; How is a Child produced?—If it be according to the ancient Theory, by a Mixture of ſeminal Matter, different as to Heat and Cold, Moiſture and Dryneſs, and aſſiſted by a Plaſtic Nature: or if, according to the modern Hypotheſis, it be by an Animalcule finding Entrance into an *Ovum*, where, meeting with proper Nouriſhment, it thrives, and

puts on a Form quite different from what it had before; or, as others hold, from an *Aura*, or certain *Effluvia*, pervading and impregnating the female *Ova:*——In the firſt Caſe, what Similitude has this mixt ſeminal Matter to the Faſhion of a Child? and what is this Plaſtic Nature that favours it with a Form?——In the Second Caſe, How is this Animalcule itſelf, and the *Ovum* that receives it, generated?——Or what are the *Effluvia* ſuppoſed by Others?——Conſider it how you pleaſe, is not this as amazing as the Production of the *Polype?*

When a Twig is cut off, and by planting in the Earth becomes a Tree of the Kind whereof it was a Part, can we account for its becoming ſo, any thing better than we can for the like Effect in a *Polype?* or is there any Reaſon to ſuppoſe Providence uncapable of beſtowing the ſame Ability on an Animal? The whole Difference is, we have known the One a long while, and the other is a late Diſcovery, which has not yet been noticed in our Syſtem of animal Life: but now we are become acquainted with it, let us raiſe our Thoughts from the Creature to the Creator, and not ſhut our Eyes to ſuch viſible Marks of the inviſible Operations of the Deity.

'Tis

'Tis no great Wonder that Diſcoveries contrary to old and eſtabliſhed Opinions ſhould not at firſt be credited; but then, neither ſhould they be abſolutely rejected till Experiment has been made whether they are true or falſe.

There is a middle Way between Over-credulity and an abſolute Denial of the Poſſibility of a Thing, which a Man of Senſe and a Philoſopher ſhould always ſteer in: for 'tis as contrary to his Character raſhly to reject any Thing, becauſe it has not come to his Knowledge, or that he can't account for it, as it is to believe whatever is told him before he has examined it. Experiment is the Teſt of Truth, and that ſhould always be made before we wholly aſſent or diſſent. But if Facts come well atteſted by Perſons of Judgment and Credit, however extraordinary they may ſeem, they deſerve civil Treatment till they can be examined fully. Not many Ages ſince, the Belief of the Antipodes, and the Motion of the Earth, was not only thought ridiculous, but wicked: and ſeveral other Realities have been as much diſcredited formerly as they are now eſtabliſhed.

Thoſe that know the moſt, are moſt ſenſible how little they know in compariſon of

what is yet unknown, and therefore consider Things with Modesty and Candour: but Ignorance cries out at once, it cannot be:---inconsiderately measuring the Powers of Nature by the scanty Compass of its own Experience, and more ready to reject the Truth than take the Pains to find it out.--- A truly wise Man is so fully sensible how little he knows, and what Things he once was ignorant of, which he is now acquainted with, that he is far enough from supposing his own Judgment a Standard of the Reality of Things.

Providence has thought fit to confine Man's Understanding within a very narrow Circle: he sees some few of the Things immediately at Hand, and knows a little of their exterior Figure and Colouring; but as to their Composition and internal Properties, every Leaf, Feather, Pebble, or Shell can prove the Ignorance of the wisest Man that lives. His Knowledge is, however, adapted to his Wants, and sufficient for his Happiness, which must arise from his own Searches and Discoveries; and perhaps it is happy for Mankind in general, that all the Knowledge they are capable of attaining should not flow on them at once, but be acquir'd by slow Degrees; and that enough should

ſhould be left for future Ages. Is not the high Reliſh of Life in Children owing in a great Meaſure to the Novelty of every thing about them? and muſt it not be a Satisfaction to reflect, that in the grand Univerſe there is Room for new Diſcoveries and Obſervations on the Operations of the DEITY throughout all Eternity?

Now, SIR, it is high Time to put an End to this long Letter, wherein I don't pretend to give a full Account of this wonderful Animal, the *Polype*, but only a few Obſervations made according to the beſt of my Judgment, and ſome Experiments faithfully related; which, I hope, may ſerve to ſatisfy the Enquiries of the Curious, till they have Opportunities of examining and judging for themſelves; and it is with great Satisfaction I addreſs this Attempt to One in whom the Scholar and the Gentleman are remarkably united, and whoſe Candor and Good-nature will, I know, ſet others an Example of excuſing its Inaccuracies and Defects: One ſo ſingularly happy as to be Maſter of every Science without Pride, Affectation, or Vanity: affable, courteous, and communicative to All: a zealous Encourager of every Kind of Knowledge, and a ſteady Advocate for Truth.---Happy is the

Royal

Royal Society in having ſuch a PRESIDENT! And that it may enjoy him long, and be crown'd with Proſperity and Honour, is the ſincere Wiſh of,

SIR,

Your moſt obedient

Octob. 1. 1743.

And moſt humble Servant

Henry Baker.

CONTENTS

OF THE

CHAPTERS.

CHAP. I. *The general Appearances and Motions of the* Polype Page 11

Chap. II. *Of the Sorts of* Polypes 17

Chap. III. *Of the* Polype's *Body* 24

Chap. IV. *Of the* Polype's *Head* 31

Chap. V. *Of the* Polype's *Arms* 34

Chap. VI. *Of the* Polype's *Stomach* 46

Chap. VII. *Of the* Polype's *natural Way of producing its Young* 49

Chap. VIII. *Where* Polypes *are to be sought for, and how to find them* 62, 70

The Manner of seizing their Prey described 63

Their Diseases and Cures 72, 76

Chap.

Chap. VIII. *How to feed, clean and manage them at all Seasons* Page 73
How they are affected by Air, Heat, Light, Motion 80
The Way of drying and preparing them for the Microscope 84
Chap. IX. *Of cutting* Polypes *asunder, and their Reproduction: with occasional Observations and Remarks* 87
Chap. X. *A Course of Experiments on the* Polype 101
Experiment I. *Cutting off a* Polype's *Head* 101
Exper. II. *Cutting a* Polype *in two Pieces, transversly* 112
Exper. III. *A* Polype *cut in three Pieces transversly* 116
Exper. IV. *Cutting the Head of a* Polype *in four Pieces* 121
Exper V. *Cutting a* Polype *in two Parts, lengthways* 125
Exper. VI. *Cutting a young* Polype *in two Pieces whilst still hanging to its Parent* 127
Exper. VII. *Cutting a* Polype *lengthways through the Body, without dividing the Head* 130
Exper. VIII. *A Repetition of the foregoing Experiment, with different Success* 132

Chap.

Chap. X. Exper. IX. *Cutting a* Polype *in two Places through the Head and Body, without dividing the Tail* Page 134
Exper. X. *Cutting off half a* Polype's *Tail* 136
Exper. XI. *Cutting a* Polype *tranſverſly, not quite through* 140
Exper. XII. *Cutting a* Polype *obliquely not quite through* 142
Exper. XIII. *Slitting a* Polype *open, and cutting off the End of its Tail* 144
Exper. XIV. *Cutting a* Polype *with four young Ones hanging to it* 151
Exper. XV. *Quartering a* Polype 157
Exper. XVI. *Cutting a* Polype *in three Pieces the long way* 160
Exper. XVII. *An Attempt to turn a* Polype, *and the Event* 164
Exper. XVIII. *Turning a* Polype *inſide out* 169
Exper. XIX. *An Attempt to make the divided Parts of different* Polypes *unite* 175
Exper. XX. *A ſpeedy Reproduction of a new Head* 178
Exper. XXI. *A young* Polype *becoming its Parent's Head* 180

Chap.

Chap. X. Exper. XXII *A cut* Polype *producing a young One, but not repairing itself* Page 184
Chap. XI. *A microscopical Discovery* 198
The Conclusion. 201

FINIS.

(Lately Publiſhed)

THE

MICROSCOPE Made Eaſy:

OR,

I. The *Nature, Uſes*, and *Magnifying Powers* of the beſt Kinds of MICROSCOPES *Deſcribed, Calculated*, and *Explained:*

FOR THE

Inſtruction of ſuch, particularly, as deſire to ſearch into the WONDERS of the *Minute Creation*, tho' they are not acquainted with *Optics*.

Together with

Full Directions how to *prepare, apply, examine*, and *preſerve* all Sorts of OBJECTS, and proper Cautions to be obſerved in viewing them.

II. An Account of what ſurprizing *Diſcoveries* have been already made by the MICROSCOPE: With uſeful Reflections on them.

AND ALSO

A great Variety of new *Experiments* and *Obſervations*, pointing out many uncommon Subjects for the Examination of the CURIOUS.

By *HENRY BAKER*, Fellow of the *Royal Society*, and Member of the Society of *Antiquaries*, in *London*.

Illuſtrated with COPPER PLATES.

The SECOND EDITION: With an additional *Plate* of the *Solar Microſcope*, and ſome farther Accounts of the POLYPE.

Rerum Natura nuſquam magis quàm in Minimis tota eſt.
PLIN. Nat. Hiſt. Lib. xi. c. 2.

LONDON:
Printed for R. DODSLEY, at *Tully's Head* in *Pall-Mall*, and ſold by M. COOPER in *Pater-noſter-Row*, and J. CUFF, Optician, in *Fleetſtreet*. 1743.

(Speedily will be publiſh'd)

THE GEOGRAPHY OF *ENGLAND:*

Done in the Manner of

GORDON'S *Geographical Grammar,*

Each COUNTY being conſider'd under the following HEADS: *viz.*

The NAME,	Chief TOWNS,
SITUATION,	Noblemen's SEATS,
AIR,	CURIOSITIES Natural and Artificial,
SOIL,	Remarkable PERSONS,
COMMODITIES,	Various PARTICULARS.
RIVERS,	

To each COUNTY is Prefix'd

A compleat MAPP from the Lateſt and Beſt Obſervations, ſhewing the Chief *Towns*, *Parks*, *Rivers* and *Roads*, both direct and acroſs.

ALSO

A Separate MAPP of ENGLAND, of the ROADS, Of the CHANNEL, and a Plan of LONDON.

Likewiſe,

By Way of INTRODUCTION,

A Clear and Diſtinct View of our CONSTITUTION, And every Branch of the LEGISLATURE.